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## **RUSSIAN**RENDEZVOUS

*moscow's show of strength at paris '65*

ISSUE NO  
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# The Aviation Historian®

The modern journal of classic aeroplanes and the history of flying

## Editor's Letter

WHEN WE PUBLISHED our first issue, in October 2012, we did not know what the future held; so it is with enormous pride that I welcome you to our twelfth issue, marking the completion of our third year of operations. We continue to unearth little-known and previously-unpublished material on all aspects of aviation history from every corner of the planet. It is impossible to overstate how much your continued and growing support means to us. *TAH* operates alone; we do not have an owner or corporation propping us up. We do not have a big-budget marketing department or the benefits available to large publishing companies. We fly alone in congested skies, our independence precious and unique. We rely on your support — because you value fearless, independent, high-quality publishing. Thank you.

In this new issue it is a privilege to be able to publish for the first time some of the exceptional photographs taken by the late John Stroud — no relation, incidentally — on one of the many globe-spanning info-gathering expeditions he undertook during his extraordinary 75-year career in aviation. We plan to bring you regular selections from *A Flying History Ltd's* recently-acquired collection of John's rolls of 35mm film, many of which have never been published anywhere before.

Since our launch we have brought you some 184 in-depth features, complemented by rare photographs, maps, drawings and Ian Bott's incomparable info-graphics. To explore all that *TAH* has covered, download the regularly-updated PDF index from our website — [www.theaviationhistorian.com](http://www.theaviationhistorian.com) — where you will also find film clips, feature previews, exclusive animated graphics, our lively social media streams and lots more goodies. *TAH*, in print and online, is the one-stop shop for aviation's "true believers"!

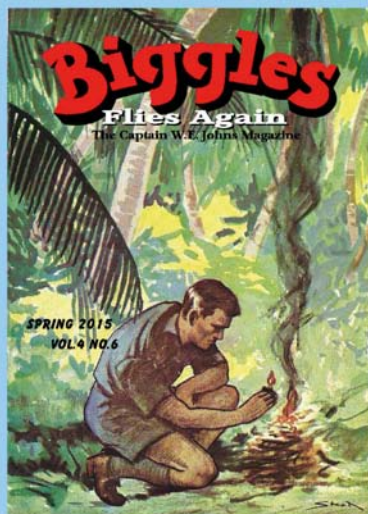
**FRONT COVER** *50 years ago the Soviet Union brought its state-of-the-art airliners to the Paris Air Salon, including the Il-62 and An-22.*

**BACK COVER** *One of the magnificent — and previously unpublished — photographs taken by John Stroud in Pakistan in February 1962.*



## The Secrets of Captain W.E. Johns' Correspondence Archive

Recent acquisition of some of WEJ's private papers has revealed many previously unknown facts about the man and his literary career.



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# AIR CORRESPONDENCE



## Letters to the Editor

### Keeping the non-skeds safe

**SIR** — I was very taken with David H. Stringer's *Non-Skeds!* and *Against All Odds* articles on the USA's non-scheduled airlines in *TAH9* and *TAH10*, mainly because of comparisons with the UK. The same issues were faced by the UK and the Air Registration Board (ARB) and I think the postwar turmoil, moving rapidly into the Berlin Airlift, rather wrecked things in terms of having a working system with a good safety record.

Initially, I think, most things "went", as it was always going to be better than wartime. I have some International Civil Aviation Organisation (ICAO) documentation, plus my own knowledge of how safety standards developed, that are an interesting reflection on what David Stringer said. Reading between the lines, the FAA (Civil Aeronautics Board) was struggling, partly because of the geographic size of the USA and of maintaining uniformity of rule application (a problem that still exists).

During the post-war period, probably post-Berlin, the ARB tackled the problem head-on and instituted an annual flight-testing programme for all aircraft. This evolved over the years and

was still in place until the takeover by EASA. At this point, because the system was unique to the ARB/CAA, the UK vote was outnumbered. As well as limited handling tests and systems tests, engine-inoperative performance was always checked. (For Daks, C-46s, Rapides and Vikings, with a very low performance capability being permitted, this was always fairly "interesting".) In the USA the FAA allowed airlines to assure safety standards by voluntary air testing (that of the ARB/CAA was mandated). I went through all this with all the American airlines about 15 years ago and while some airlines checked things only after major maintenance (every 5–10 years?), some, such as TWA, had an annual check on every aircraft in the fleet, so did more than the CAA. So the American standard was highly variable, the onus being on the airline to be "safe", rather than the ARB/CAA satisfying themselves that an airline was safe by testing it.

In 1946 ICAO/ARB did a lot of testing on Daks and Vikings on how performance deteriorated with engine hours. Then, of course, the basic standards were improved to what we have today, where a Boeing 777 on one engine will

**Coach class** — cheap, but how safe was it? Curtiss C-46D N95445, ex-USAAF 44-78081, flew with non-scheduled carrier Aero Coach, established in 1950 as a division of the Aero Finance Corporation. It later served in Latin America, finally flying into a mountain near Rioja in Peru, on February 23, 1966. See Graham Skillen's letter on these pages.

JOHN WEGG VIA DAVID H. STRINGER





RAF Transport Command Bristol Britannia XL636 over a glorious cloudscape. Harry Liddell captained sister aircraft XL638 which accompanied No 617 Sqn's ill-fated Avro Vulcan global tour in 1959 — see his letter on this page.



climb at 1,000ft/min — a Dak only managing about 150ft/min!

Again the UK system did not discriminate between scheduled and non-scheduled operations, the criterion being the carriage of fare-paying passengers; the ARB's inimitable Dave Davies always said that paying a fare was in expectation of getting to your destination, so the safety standard should be the same. Of course, when you go back a bit, charter airlines in the UK had no money, so safety did suffer. The CAA usually drew the line, however, when an airline borrowed good engines to do airtests.

**Graham Skillen** North Cheriton, Somerset

## Wellington Vulcan eyewitness

**SIR** — I was most interested to view on your website the video clip of the Vulcan incident at Wellington airport in October 1959 [which complemented the article *A Close Shave at Wellington in TAH5* — Ed], as I witnessed it myself.

Built on a narrow isthmus, the runway was barely 6,000ft (1,830m) long with a pronounced drop at either end; a slightly intimidating prospect for anyone (such as V-force pilots?) accustomed to rather more footage. The aircraft had already made two approaches and roller landings, and tragically could easily (in my opinion anyway) have stopped after the second; however, the captain elected to go for a third attempt and right from the beginning of final approach it looked wrong — too shallow and “draggy”, with nose high and loads of power on, and so I was not much surprised to see a cloud of dirt fly up as it touched short. Tilting to the

left due to the damaged landing gear, it looked for a moment as if the Vulcan might swerve into the public enclosure, but fortunately the throttles were slammed to full power and it got off again, fuel from a ruptured tank streaming back into the jet efflux. Expecting a possible fireball, I held my breath; but luck held and the aircraft got back to Ohakea without further trouble.

Indeed it was not a very auspicious opening day for Wellington's new airport, for the RNZAF contrived to write off one of its surviving Short Sunderlands! While making a low flypast up the runway it hit what old-time aviators called an air pocket (weather was typical Wellington, gusty and showery), losing sufficient height to scrape the hull along the tarmac (this I also witnessed) and hole it. After alighting back at its base the pilot attempted a rapid taxi to shore, but sank before he got there!

Altogether it was not a very successful tour for No 617 Sqn, for in addition to the Wellington affair the unit's other two Vulcans hit trouble; one at Karachi on the way out (brake fire, due to pilot opting not to use braking 'chute), the other at Offutt AFB when a sequencing fault during undercarriage retraction resulted in serious damage. It has to be said that the Vulcan had a poor safety record at air displays, for they were involved in a number of other accidents (at least two of them fatal) during such events.

How do I know all this? Well, I was captain of the supporting Bristol Britannia [XL638] accompanying No 617 Sqn during its global tour; altogether, it was quite a saga!

**Harry Liddell** Fairford, Gloucestershire

### A month with the US Marines

**SIR** — As a recent subscriber I would like to congratulate you on your excellent publication. The quality and variety of the articles is really first class. My interest in aviation history spreads from the 1920s right up to the present day, but I have a particular interest in the 1960s and '70s and a personal interest in the AV-8A and VMA-513. So *TAH10* was of great interest and brought back many memories.

I joined the RAF as an engineering apprentice at RAF Halton in 1957 and graduated in 1960. My first posting was to No 111 Sqn, the famous "Black Arrows", during its last season with the black Hunters. Shortly after I joined, we re-equipped with the state-of-the-art Lightning F.1A. I did two tours on the Lightning. My second was on No 29 Sqn with the F.3.

Leaving the RAF in 1970 I joined Fairey Aviation as a field service engineer. Fairey employed four service engineers and each was given responsibility for the Fairey powered flying controls installed on specific aircraft. When I joined Fairey these were the Hunter, Trident, Jaguar, Lynx and Harrier. After training I was given the SEPECAT Jaguar, then a joint venture between BAC and Breguet. I settled down to a very interesting time commuting between BAC Warton, where the Jaguar was being assembled, and the Breguet flight test facility at Istres, near Marseilles.

In 1972 we became aware that the AV-8A Harriers operated by VMA-513 were suffering significant problems with their tailplane powered flying control units (PFCUs) in the form of uncommanded inputs, either nose-up or, more significantly, nose-down. The USMC was flying

low-level ground-support missions, so this was a very serious situation and Fairey had to come up with a solution pretty darned quick. It was rapidly deduced that the fault lay in the servo valve unit, so a redesigned duplex servo valve was designed, built and tested in quick time.

Out of the blue, I was called to report to the Chief Designer, Derek Williams. The normal Harrier engineer was away on holiday and someone would have to travel to Beaufort, South Carolina, as soon as possible to modify all the PFCUs. Was I up to going? Of course! Before I knew it, I was on a Pan Am 747 winging across the Atlantic on my very first visit to the USA.

I was met by the McDonnell Douglas Tech Rep, who took me to a nice hotel in Beaufort and told me to rest up and he would call for me at 0700hr the next morning. His parting comment was that you cannot live and work in the USA without a car, and suggested I call Hertz and have them deliver one to the hotel.

My company car in the UK was a 1.1lit Ford Escort, so imagine my surprise and delight when I discovered that I had been given a brand new Ford Gran Torino (remember *Starsky and Hutch?*) with a 5lit V8 engine. Wow!

On arrival at the squadron hangar the tech rep introduced me to the VMA-513 engineering team and I was given a crew of Marine engineering specialists with all the support I needed on site. The guys could not have been more helpful.

The job entailed the Marine engineers removing each tailplane PFCU and setting it up in their hydraulic bay. I stripped the units down and rebuilt them using the new servo valves. Each PFCU had to undergo a detailed and comprehensive test routine to ensure that all was OK.

TAH ARCHIVE



An AV-8A Harrier of VMA-513 on the ramp at MCAS Beaufort, South Carolina, where Fairey field service engineer Kenneth Smith spent a happy month in 1972 — as described in his letter on these pages.



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The process took about a day for each aircraft. I have to say I had a few nervous moments as the first modified Harrier roared into the air!

I spent a month with VMA-513 and enjoyed every minute. To this day, a unit badge has pride of place on my study wall. Great memories.

I left Fairey in 1973 to join the aerospace division of Pall Corporation, based in Portsmouth. Amongst the highlights of 24 years with Pall was travelling all over the world, upgrading a fleet of Mil Mi-8 helicopters in Yemen and joining the Coalition as an advisor during the first Gulf War. But that's another story!

Thanks for a great publication.

**Kenneth P. Smith** Langstone, Hampshire

### A non-standard Camel

**SIR** — The erroneous marking of Duncan Menzies' solo Avro 504K (*From Farmer to Test Pilot*, TAH 11) struck a chord.

In the mid-1950s I served for a while as RAF Detachment Commander to the north-east of Aden, in the Hadhramaut.

Our water carrier camel died so, after a great deal of haggling, I purchased a replacement for the sum of £25 Sterling, paid in near-pure silver Maria Theresa dollars (then still minted by the Bank of England, but dated 1780). The camel driver assured me she was a beautiful camel. To me she appeared bad-tempered, though a certain winner in a halitosis competition. Nevertheless, after having RAF roundels painted on her flanks, she passed muster. I named her "Sopwith" and duly entered her in my book of Prime Movers: "Camel, Sopwith, Serial No B1530" (my birth date).

Any equipment officer worth his salt would immediately have spotted the error; B1530 was in fact a Spad 7.

**Desmond Penrose** Wheathampstead, Herts



**LEFT** Camel B1530, bought for the RAF in the mid-1950s by Desmond Penrose and named Sopwith, being "piloted" by camel-driver Musa in the Hadhramaut. The painted-on roundel on Sopwith's flank is hidden by the jerry-can pannier. The other two camels in the picture were unserialised. See Desmond's letter on this page.

**BELOW** Air Chief Marshal Sir Claude Pelly, C-in-C Middle East Air Force (in shorts and long socks), accompanied by Desmond Penrose, inspects the latter's Askari riflemen. "Barefoot but excellent shots," Desmond tells TAH, "and they could wipe the floor with us at football." DESMOND PENROSE x 2





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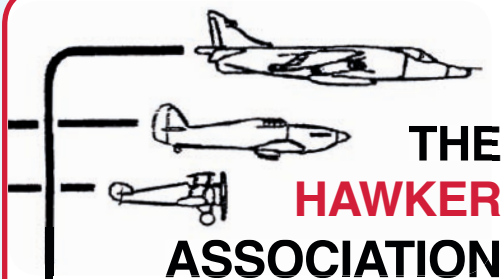
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# Our Man in the Middle East

In 1959 the late **DAVID LOCKSPEISER**, then a Hawker production test pilot, set off on a liaison tour to see how the Hunter was behaving in service with its numerous operators in the Middle East. His first-hand account of the tour includes how, in India, orders arrived to divert immediately to Burma to investigate a mysterious spate of Sea Fury crashes . . .

LOCKSPEISER FAMILY ARCHIVE







**S**OME OF THE duties I had to undertake in my role as a production test pilot at Hawker Aircraft Ltd from 1955 included air displays, demonstrations, conversion training and paying liaison visits to customer air forces. The latter were made with the object of helping to sort out any queries or problems they may — and inevitably did — have, and acquainting them with current Hunter developments that were going on at Dunsfold. One such trip was to visit Hunter operators in the Middle East and India, to which John Gale, the Hawker Service Department Manager, and I set off in September 1959.

#### TO JORDAN AND LEBANON

Our first port of call was Jordan. The Jordanians were very sharp under the excellent leadership of Erik Bennett, an RAF squadron leader on loan who, with other loan officers, had the place running like a good RAF squadron. While flying with the Royal Jordanian Air Force (RJAF) from Mafraq we flew high-level battle formations, tailchases and low-level battle formations over the Dead Sea; seeing minus 1,100ft (-335m) on my altimeter was a new experience for me. In addition to discussions with senior RJAF officers I had the opportunity to meet King Hussein, who was very keen to talk about aircraft and flying — an admirable monarch.

We next visited the Lebanese Air Force, which had its HQ in Beirut and its main airfield at Rayack in the Bekaa Valley. The Lebanese did not benefit from the same quality of representation from the RAF, so were short on operating procedures as well as spares. There was almost a flying-club atmosphere and not too much radio discipline. I was flying No 3 in a formation which kept making sudden unexpected changes of direction — I was not at all sure how many of us were on the same frequency. There was a bit of drama when No 4, after peeling off and dropping a sonic bang in the general direction of his girlfriend's house, announced he was on fire; nevertheless we all managed to get back OK. It was humbling to learn that in addition to their manuals being in English, they all, pilots and groundcrew alike, spoke Arabic and French too.

Iraq we did not visit. The Iraqis had a few Hunters and had been poised to buy many more in July of the previous year when I went to Habbaniya to give an armament demonstration to the 18-year-old King Faisal. Unfortunately he was assassinated a few weeks later by a communist revolution under Kassim. It was not until after that revolution was in turn ousted by the Ba'athist takeover and we were all pals again that, in June 1963, Alf Black, a Service Department engineer, and I flew out in G-APUX, Hawker's two-seat Hunter demonstrator painted in Iraqi colours. The idea was to instruct Iraqi

---

**OPPOSITE PAGE** *The author relaxing in the 1950s. David Lockspeiser MRAeS CEng died in March 2014 — see TAH8 for a fuller account of the much-respected test pilot and aircraft designer's career. TOP* The day job; in 1955 the author left the RAF to join Hawker Aircraft, for which he became a production test pilot for the shapely Hunter.



**LEFT** The author (second from right) with pilots of the Royal Jordanian Air Force during the 1959 Hawker liaison tour of the Middle East. Jordan acquired 12 ex-RAF Hunter F.6s in November 1958 and went on to become a regular customer for the type, later obtaining ground-attack, photo-reconnaissance and two-seat trainer variants of the ubiquitous jet fighter.

**BELOW** India placed an order for 160 Hunter F.56s in September 1957 and deliveries began that November. The initial batch of 32 were new-builds, but the next batch of 16 had all been built to an RAF contract and completed to F.56 standard, including BA239 — originally XE600 — seen here at Dunsfold before delivery. Interestingly, it was rejected and returned to Hawker in 1959 and replaced by a new-build, also serialised BA239.

flying instructors so that they could supervise conversion training, but in reality I was given all their would-be Hunter pilots, who previously had only flown Russian aircraft. But that is another story, made all the more interesting as the Russians were still there.

### ON TO INDIA

We next visited India, our last port of call — or so we thought. John dealt with the engineers and I liaised with the pilots, although of course for discussions we frequently joined forces. There were three Hunter squadrons, and a fourth being formed, at Ambala in the north, the Indian Air Force's largest fighter base. The Indians also had some Dassault Ouragans which seemed to be permanently standing in pools of Avtur from leaking wing tanks. Poona, further south, was a newer airfield and in the process of expanding. The Indian pilots had the usual questions that squadron pilots have, and asked me to test the odd aircraft whose behaviour they queried, but their main interest was spinning demonstrations.

TAH ARCHIVE

The first demonstration I see from my logbook was on October 7, 1959, at Ambala, for Wg Cdr Engineer, the Wingco Flying. We performed the first spin to the left, recovering normally, and then performed one to the right. During this one the two-seat Hunter T.66 rolled over inverted and the hitherto-trusty Rolls-Royce Avon engine flamed out. This really was an unexpected turn of events and despite my efforts to convince the wing commander it was not normal, he remained sceptical.

To get to Poona we flew by Vickers Viscount to Bombay (now Mumbai) and checked into the Taj Mahal Hotel, which had a wrought-iron arch above the entrance stating "Dogs and South Africans not admitted". India had an alcohol ban at that time and, when I found the bar was empty except for a barman and an armed policeman, I was told the only way I could have a drink was to get a licence from the police station stating that I was an alcoholic. So I accepted the challenge and the next day set off to get said licence. The sad thing is that I have lost





One of 18 single-seat Sea Fury FB.11s bought back from the Royal Navy by Hawker and refurbished for sale to the Union of Burma Air Force during 1957–58, UB459 (originally VR693 in Fleet Air Arm Service) is posed for the camera. Three two-seat Sea Fury T.20s were also supplied to Burma.



this documentary evidence of my qualification; it was pale green and about half as large again as A4. It is not beyond the realms of possibility that someone nicked it, as it was a licence hard to come by and well worth having.

While we were in India we received a message from our Director at Kingston and also from the British Air Attaché in Burma about the recent grounding of the Union of Burma Air Force's (UBAF) Sea Furies. This followed a number of fatalities without any clue as to the cause of these seemingly mysterious accidents. John and I were asked to go there to try and find the cause and help if possible. This could be quite a problem, which we worried about as we organised our visas and got airline tickets. We managed to get a flight and bummed a ride on a BOAC crew bus to Palam airport outside Delhi, arriving in Rangoon, then the capital of Burma, some hours later on October 20, 1959.

### THE BURMESE TRIANGLE?

Hawker had an agent in Rangoon, but it was the Air Attaché, Gp Capt Teddy Pippet, who gave us a full briefing and provided an enormous amount of help and hospitality over the whole period. He took us to see Brig-Gen Tommy Clift, the Chief of the Air Staff, and a senior staff officer, Sqn Ldr Saw Pru, who gave us *carte blanche* to do whatever was necessary to get the Furies airborne again.

As it happened I knew Saw Pru; we had been on the same Pilot Attack Instructor course at RAF Leconfield in 1952. There were two Burmese pilots on the course but they only did the groundschool element because the Burmese government couldn't afford to pay for the flying, which was on Meteors and Vampires.

We were driven out to the UBAF base at Hmawbi, north of Rangoon, to discuss the accidents with the squadron commander. We looked at the remains of a Fury, and also got an engineer to translate the court of enquiry report on aircraft number UB469 (previously WM488 in Fleet Air Arm service). These accidents all had one thing in common — none of the pilots had uttered a sound, let alone a word, over the radio — and so it seemed most likely they were either unconscious or dead before the aircraft hit the ground. Most had crashed in the numerous paddy fields that covered the country, and we were taken to one of these crash sites in a Piasecki helicopter. There was no evidence at all at the site, other than from vocal members of the large local farming community, who pointed to an area of paddy and said of another of the crashed Furies, UB464 (formerly VR929): "It was down there". Two villagers said there was a bang, black smoke and a small fire, and some reports of yet another example, UB470 (previously WN486), stated that it was smoking when it crashed.

The following is an excerpt from my diary: "I think it possible that petrol fumes from a loose pipe or filter started a fire; fumes and smoke entered the cockpit, causing unconsciousness of pilot".

Bristol had an engine representative out there, Bill Chard, and we worked together on that assumption. On the fourth day my Hawker colleague John received a message to return to India as soon as he was able, to help with investigating a recent fatal Hunter accident. It seemed the most likely cause of these Fury accidents was from carbon monoxide poisoning; further evidence for the theory was found in



DAVID LOCKSPEISER

**ABOVE** An extremely rare colour photograph of Burmese Sea Fury UB462 — formerly VW667 in Fleet Air Arm service — beside Hawker's civil-registered Hurricane, G-AMAU, The Last of The Many (still flying today with the Battle of Britain Memorial Flight with its original serial, PZ865) at the Hawker factory at Squires Gate in early 1958.

the very poor state of servicing the aircraft had received, leading to oil and hydraulic leaks, missing panel fasteners and a dismal standard of servicing for safety equipment. From the cockpit-air intake in the starboard wing root, air passed an oil union which, if loose, could add to the problem. The Burmese did not use oxygen — “didn’t fly high enough” they said — and some oxygen masks, which were only used because they housed the microphone, were attached with a safety pin. The senior engineering officer, a nice fellow, had a supernumerary job as messing officer, a task which he performed with great diligence, spending most days at the local meat and vegetable markets and not at the airfield.

The pilots were clearly apprehensive about the thought of getting into the air again and this was aggravated by another cause that I learned about with a certain amount of dismay; the pilots had consulted a *phongyi* (soothsayer), who put the fear of hell into them by saying the accidents were caused by the ghosts of the dead pilots. Some pilots showed interest in their aircraft, but little was shown by most and least of all by the squadron commander, who seemed to spend most of his time playing mah-jong.

We made a plan of action, which was to get the aircraft comprehensively serviced and get the daily inspections (DIs) performed twice, using separate teams. The oxygen system was to be

made operational and all other safety equipment was to be carefully inspected. And we contacted Rangoon University to get some evacuated flasks with which to take samples of cockpit air. This worked well and three enthusiastic learned gents, a PhD and two MScs from the University’s chemistry department, arrived.

### TESTING AND SIGHTSEEING

It took them a bit longer than I had hoped, so before they returned, I did some flying on the aircraft chosen for the tests, UB456 (formerly VW694) fitted with droptanks, after the servicing programme had been completed. And when they did return, it was not only with the evacuated flasks but with crystals and CO-sensitive paper, with which I decorated the cockpit.

This test was going to be of long duration, so I combined it with a sightseeing tour of southern Burma and Rangoon, viewing the Shwedagon Pagoda and the Gulf of Martaban before heading up-country and around the Bay of Bengal. There was no change of colour on the paper or in the crystals during the flight and the results from the university showed the flasks contained a very small and entirely safe amount of CO. The content did not vary between samples taken at the beginning, middle or at the end of the flight. The professor and his team had really entered into the spirit of things, and turned





**ABOVE** Burmese aircrew pose alongside one of the UBAF Sea Furies at Hmawbi during the author's visit to Burma in 1959. Despite the UBAF pilots' trepidation when it came to flying the mighty Bristol Centaurus-powered fighter, the type remained in Burmese service until the late 1960s, when it was replaced by the Lockheed T-33.

up unexpectedly some days later with even more evacuated flasks, so I performed a further confirmatory check on another aircraft.

On October 26 I visited the War Office in Rangoon and persuaded the powers there to lift the flying ban on four of the single-seat Furies and one two-seater, all of which had been fully serviced and flown. As I feared, this was not met with much enthusiasm at the squadron, where I gave a lecture to both air- and groundcrew explaining the cause of the accidents and stressed the importance of following the procedures both technical and operational.

I felt sorry for these lads; they mostly came from a rural background and, as I recall, had only flown the Hunting Percival Provost. They had not had the benefit which we in the West have of being brought up with things mechanical, so, not surprisingly, they could be easily intimidated by an aircraft with the potency of the Sea Fury.

Earlier I had made an offer to the youngest pilot, who had 10hr on the Fury, to fly with me in a T.20, but he was not at all keen. I'm sure he would have been, had the leadership he experienced been more enthusiastic. The Air Staff had of course been kept aware of all that was going on, and I submitted a report of recommendations covering all aspects, which Teddy Pippet had a secretary type up for me, and which the Air Staff said it would action. The

Burmese flew their Furies again and shortly had a section of four airborne over Rangoon.

On Sunday November 1, 1959, I left Burma to return to Delhi. John Gale and I had decided it would be more interesting to follow the local Aeroflot advertisements and return to London via Moscow. We got our visas, had our tickets altered and arranged for the documents relating to our business to be returned to the UK via our Air Attaché's diplomatic bag. We should have departed on the 4th, but unexplained delays throughout the day caused it to become the 5th, and we were taken to spend the night at the Janpath hotel. Here we met an American, Tom Stapleton, who ran an artists' supplies and leather goods shop in San Francisco.

## UZBEKISTAN AND GEORGIA

We took off from Palam for Tashkent in Uzbekistan at 1445hr on the 5th, having been woken up at 0430hr to catch the Tupolev Tu-104 flight. I timed the take-off run to be 51.5sec, with very little runway left. We were not full, so maybe it had been too hot to take off earlier. We looked down on the most beautiful scenery as we flew over the Himalayas. On arrival at Tashkent I counted more Tu-104s on the hardstanding than BOAC had Comets in its entire fleet.

During the next long wait I discovered, in a separate part of the airport building, an

**Tupolev's Tu-104 revolutionised air travel in the Soviet Union following its introduction into Aeroflot service in late 1956, being more than twice as fast as its piston-engined predecessors. With the British Comet withdrawn from service, the Tu-104 was the only jetliner in service anywhere in the world during 1956–58. This example, CCCP-42474, is seen at Tokyo's Haneda Airport in July 1960.** PETER KEATING © A FLYING HISTORY LTD



enormous hall full of people, some brewing up tea. They had suitcases, parcels and chickens and were all waiting to fly in Antonov An-2 biplanes, presumably out to their collective farms. They certainly made use of air travel.

Owing to snow in Moscow we were diverted to Tbilisi in Georgia. Here, and on all occasions when we disembarked, the other passengers held back politely to allow the foreigners, of whom there were about a dozen, off first. We were taken to the place where we were to sleep, which was a lovely large old house commandeered as a hotel overflow, and which presumably belonged to the elegant elderly aristocratic-looking lady who was beavering around making sure we all had somewhere to sleep. Tom and I decided this was too good an opportunity to miss, and, although pretty tired, set off to look at the town.

We were soon followed by three young men who were obviously taking some interest in us. Having tried the walking-faster-and-then-slower routine, we found they were still there so we turned around to face them. They of course had realised we were from the West. Tom proudly announced he was an American, and I equally so from England. And this is where I'm afraid I let the side down. This was Georgia, in the middle of the Cold War and one of the three, breathing garlic and aspic of a strength I would not previously have believed possible, named every member of the Manchester United football team. I was impressed but didn't know any of them. Stanley Matthews — at that time Britain's most famous footballer — surely I must know him? No, I knew of him but did not know him personally. He gave up when he discovered I

was not a personal friend of Margot Fonteyn. They, being Georgians, were very pro-Stalin and highly critical of their government; Khrushchev they called a clown. Tbilisi looked from what little we saw to be an elegant old town.

## ON PARADE IN MOSCOW

When we got to Moscow the following day we stayed in the Hotel Ukraine. The following day, Saturday November 7, was the 42nd anniversary of Russia's October Revolution (according to the old Julian calendar) and the state travel agency, Intourist, had arranged for us to go and watch the parade from the National Hotel, adjacent to Red Square.

While watching all the military and associated parades we got talking to an interesting Englishman called Eldon (later Sir Eldon) Griffiths [*who died in June 2014 — Ed*]. He was the Foreign Editor (later Managing Editor) of *Newsweek*, based in New York, and subsequently became the Conservative MP for Bury St Edmunds and a junior minister in the Heath government. He, Tom and I thought it was rather boring watching the parade high up from the restaurant window, and that it would be much more interesting to view it from Red Square. Eldon, who knew about these things, taught us to say in Russian "peace and friendship" and "delegate", since it might come in useful. Particularly when combined with a smile, it did.

We set off for Red Square but were stopped from entering by steely-eyed gents with large trilby hats and brown leather coats reaching nearly to the ground. Having been rebuffed a few times we did not want to attract too much attention, so we walked round to the nearby





**LEFT** *The author during his tenure as a production test pilot for Hawker. A keen designer and engineer, he went on to develop the unusual Land Development Aircraft. BELOW* Ilyushin Il-18 CCCP-75816 on the move at Heathrow in April 1964. The turboprop airliner was equivalent in size and performance to the British Vickers Vanguard and American Lockheed Electra.

PORTRAIT: LOCKSPEISER FAMILY ARCHIVE

of young people were trying unsuccessfully to barge their way through, with much laughter between them and the soldiers. We, however, felt we were in a different category, and this was spotted by a young man who turned out to be a Georgian, who came and offered to see us through the cordon. Having done so, he had more than earned his lunch — his favourite meal of borscht — at the National Hotel, where we met up again with John.

### HOMeward BOUND

We did some sightseeing and travelled on the magnificent underground and met some very nice people. Most were quite open in their opposition to the regime, saying that they had money but there was nothing to buy. However, they were cautious in not being seen to accept anything from us and I arranged to hand over some novels I had surreptitiously and well away from the hotel. We met an interesting young couple — I remember being surprised that the chap was wearing a duffel coat — and in the evening we danced in Revolution Square, sang songs from *My Fair Lady* and finished up drinking Georgian-style champagne on the 30th-floor bar of the Ukraine Hotel. All of which only confirms what I think most people who have had the good fortune to visit other countries know; generally, people everywhere are nice — it's the politicians that cause the trouble.

On November 8 we returned to the UK in an Ilyushin Il-18 — like a Vickers Vanguard but without the shuddering — routing via Copenhagen. What a contrast that was! We had been away exactly six weeks.



Revolution Square, where lots of people were forming up behind banners in columns eight or ten wide. Everyone was very jolly, laughing and joking, and we didn't need a second invitation to join in. Linking arms, we set off, all smiles. What organisation we were with we had no means of knowing; it could have been a factory or a farm, so we settled for Tom's suggestion that it was the "Kazakh Needlewomen's Commune".

On our way to Red Square we had to pass the large trilby hats who had refused us entry, so we were careful to avoid eye contact and clutched more tightly the person with whom we had linked arms, in my case a jolly lady wearing a coat that looked as though it had been made from an old army blanket. We marched past and very close to the podium we have all seen on television, with Khrushchev, Brezhnev and the rest of the Politburo. Having marched, walked really, past the Russian government we thought we had better break off. Also it was lunchtime.

There was some reluctance by our new friends to let us go, but we eventually managed to get away, only to find we couldn't get out of Red Square. Every exit was blocked by soldiers in light grey overcoats, all arms linked. Groups

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# OVER THE WEATHER

## “TOMMY” TOMLINSON & TWA’s 1930s HIGH-ALTITUDE RESEARCH LABORATORY

Although aircraft design was evolving with remarkable speed in the mid-1930s, the biggest challenge to commercial operators remained the weather and the inability of contemporary airliners to fly above it. **EDWARD M. YOUNG** chronicles the pioneering high-altitude work of TWA pilot D.W. “Tommy” Tomlinson, whose research flights yielded invaluable dividends





ONE TUESDAY in early November 1934, Jack Frye, Vice-President and General Manager of Transcontinental & Western Air Inc (TWA), sat down to lunch with Guy Vaughan, President of the Wright Aeronautical Corporation. For several months TWA had been flying its Wright Cyclone-powered Douglas DC-2s on its transcontinental service. No doubt there was much discussion about the performance of the Cyclone engine between the two men over lunch — but Frye was already looking well beyond the DC-2, which had been in service only a little more than six months.

The plans Frye shared with Vaughan that day were ambitious; the former wanted an aircraft that would fly twice, or even three times, as high as the DC-2. That autumn Frye and his colleagues at TWA had decided that the airline should begin looking into high-altitude flight. He told Vaughan that TWA was about to begin intensive development of an aircraft that could fly at 35,000ft (10,700m), with supercharged engines and a pressurised cockpit.

Frye was by no means alone in his view that the future of commercial air transport lay in flight at higher altitudes. By the early 1930s there was a considerable body of opinion that higher altitudes offered the potential for more speed, much better economical operation and improved passenger comfort — issues that were critical to the success of the airlines. It was scientifically known that the density of air decreases with increases in altitude, and that with lower air density an aeroplane's speed would increase. At high altitudes, an aircraft could fly faster using the same amount of horsepower as at lower altitudes.

Another benefit of flight at high altitude was greater freedom from the weather. An airliner flying at 20,000ft (6,100m) or higher would be above most of the storms, severe turbulence and icing that made flying not only uncomfortable for passengers, but at times dangerous. While these benefits were known — at least theoretically — there was a host of engineering issues and challenges that had to be resolved before commercial flights at high altitudes could become a reality. For many in the industry, the

**OPPOSITE PAGE** Pioneer high-altitude pilot Daniel W. "Tommy" Tomlinson beside the Northrop Gamma in which he conducted numerous invaluable research flights during 1936–37. **TOP** The goal — TWA's Jack Frye was determined to provide the best possible service, both in terms of passenger experience and economic viability.



**ABOVE LEFT** Jack Frye in 1931, when he was Vice-President at Transcontinental & Western Air. An experienced pilot and accomplished executive, Frye remained with the airline until 1947. **ABOVE RIGHT** Daniel Webb "Tommy" Tomlinson, who fervently believed that if an aircraft couldn't be used at night or in bad weather, it was of little use.

key question was whether the benefits of flying at higher altitudes would actually contribute to airline profitability.

At the end of 1934 there was precious little data available to make a determination. In Europe and the USA there had been numerous single flights to higher altitudes in search of altitude records [see *On Heaven's Doorstep*, Tony Buttler's feature on Cyril Uwins's record-setting high-altitude flight in a Vickers Vespa in 1932, in *TAH10 — Ed*], but few sustained flights that could provide information of value to engineers and airline executives. It was hard empirical information that Frye needed and he decided that TWA would get it.

### THE PROGRAMME BEGINS

In December 1934 Jack Frye was elected President of TWA Inc. A strong and visionary leader as well as an experienced pilot, Frye was committed to advancing aviation technology. One of the first steps he took towards expanding TWA's knowledge of high-altitude flight was to agree to help sponsor record-setting pilot Wiley Post, then planning a non-stop high-altitude flight from Los Angeles to New York in his Lockheed Vega, named *Winnie Mae*. Between February and June 1935 Post made four unsuccessful attempts to complete the flight, his best effort being a flight on March 15 when he flew 2,035 miles (3,275km) from Los Angeles to Cleveland, Ohio.

While Post's flights demonstrated the greater speeds that could be obtained at high altitude, and provided useful publicity for TWA, Post did not gather any of the critical engineering data that TWA needed. Frye knew that the answers to many of the questions concerning high-altitude flight could only be found through a programme of disciplined research. Frye had just the man to undertake such a project within TWA's ranks.

In April 1935 Frye asked Daniel W. Tomlinson, then flying TWA's nightmail in Northrop Alphas between New York and Ohio, to move to the airline's headquarters in Kansas City to become Frye's technical assistant, responsible for all TWA's flight testing and engineering research.

"Tommy" Tomlinson, as he was known throughout the industry, was an engineering graduate of the US Naval Academy and had been a Navy fighter and test pilot, gaining fame as the leader of the Navy aerobatic team The Three Sea Hawks before joining Maddux Air Lines in 1929. Tomlinson had continued with the airline after its merger with Transcontinental Air Transport, and subsequently with Transcontinental & Western Air. He had served the company as a line pilot flying Ford Trimotors and Fokker F-10s, as the Manager of TWA's Western Division and as assistant to the president. As a member of TWA's Technical Committee he had played an active role in the development and testing of the DC-1.





ALPHA ARCHIVE

**ABOVE** *Blueprint for the future — the sole Douglas DC-1 made its maiden flight on July 1, 1933. The aircraft was never issued with an Approved Type Certificate (ATC) but instead operated under Memo Certificate 2-460 conditions, which allowed it to carry paying passengers as NC223Y or undertake experimental work as X223Y.*

Like Frye, Tomlinson had a keen interest in exploring flight at high altitude. As a line and nightmail pilot he had experienced more than his share of bad weather in all its forms; he knew at first hand the potential benefits that would come to pilots and passengers if aircraft could get above the weather. Coincident with Tomlinson's move to Kansas City to take up his new role, TWA's DC-1, which had been on loan to the Bureau of Commerce for tests, was returned to the airline. Since the DC-1 was not required for passenger operations, the machine was turned over to Tomlinson for his high-altitude flight research.

Frye and Tomlinson set out four principal objectives for the research programme:

- to determine the best method of engine supercharging for flights above 20,000ft (6,100m), and equip an engine for operation at 30,000ft (9,100m) at full rated power;
- to determine the increase in speed at altitude and check actual data against theory;
- to record actual airspeeds at 30,000ft;
- to make cross-country flights above the weather in order to explore wind and weather conditions at higher altitudes.

Before beginning these flights, however, Frye had Tomlinson use the DC-1 to set a number of world and American speed records in response to a call from the president of the National Aeronautics Association to increase the number

of world records held by the USA. On April 30, 1935, Tomlinson flew the DC-1 from Los Angeles to New York's Floyd Bennett Field in the record time of 11hr 5min. A few weeks later, flying a triangular course between Floyd Bennett Field, Washington DC and a point near Norfolk, Virginia, Tomlinson and his copilot Joseph Bartles set 19 records for speed and load over 1,000km, 2,000km and 5,000km.

## EXPERIMENTS WITH THE DC-1

Frye suggested to Tomlinson that he begin his high-altitude flights exploring thunderstorms and the effects of flying through them at different altitudes. Tomlinson spent the summer of 1935 taking the DC-1 through the frequent storm systems that blew east between Kansas City and Chicago. Before he began these tests, he had new Wright GR-1820-F-55 Cyclone engines with two-speed geared superchargers installed in the DC-1, coupled with Hamilton Standard constant-speed variable-pitch propellers. With the supercharged engines Tomlinson could get the DC-1 up to 27,000ft (8,200m). A liquid-oxygen system was installed for the pilot, copilot and two observers.

Before beginning his exploration of thunderstorms, Tomlinson set about conducting a series of performance tests with the DC-1 up to 27,000ft, recording data on power climbs and level flight at full cruising power and half-power to build up



experience with operating conditions at altitudes of 20,000ft and above. He then began searching out thunderstorms.

He initially started flying through the storms at 10,000–15,000ft (3,000–4,500m), then went to higher altitudes, flying through the anvil-heads of the storms at 25,000–27,000ft (7,600–8,200m). Tomlinson piloted most of the flights himself, occasionally dragooning another TWA pilot who wasn't too leery of joining him as copilot. In addition to exploring storms, Tomlinson made several extended flights at high altitudes.

In early September, in company with Harland Hull, TWA's chief pilot, Tomlinson flew from Kansas City to Newark, New Jersey, at altitudes above 20,000ft, cruising as high as 27,000ft during the 5hr 4min flight. These flights proved that continuous cruising operations up to and above 20,000ft were possible with an engine equipped with two-speed superchargers, and that by flying above 20,000ft an aircraft could clear 90 per cent of the bad weather.

While the DC-1 flights were providing valuable data on the performance of geared superchargers, Frye and Tomlinson were keen to gather similar data on the use of turbosuperchargers (turbochargers) for comparative purposes. The aviation industry had considerable experience with geared superchargers, but in America only the US Army Air Corps had devoted time and resources to turbocharger development. After learning of Frye's interest in high-altitude flight, Guy Vaughan had provided Frye with an introduction to Lt-Col Oliver Echols, Chief Engineer at the US Army Air Corps Division at Wright Field, near Dayton in Ohio. Echols was agreeable to the idea of cooperating with TWA's high-altitude research.



CURTISS-WRIGHT CORPORATION VIA AUTHOR

In between his DC-1 flights, Tomlinson and Walter Hamilton, TWA's Vice-President for Maintenance, met with Echols and the staff of the Engineering Section at Wright Field, and arranged the loan of two General Electric turbochargers from the Army Air Corps for installation on the DC-1. Tomlinson, Hamilton and James Hiestand, a TWA engineer, visited Wright Field for conferences with Army Air Corps engineers and representatives of General Electric to discuss how to install the turbochargers on the aircraft.

At Wright the team was given the opportunity to examine the turbocharger installation on a Martin YB-10 bomber, Consolidated P-30 (PB-2A) and a Curtiss P-6F. The Engineering Section provided

**ABOVE RIGHT** A photograph in the September 1935 issue of *Trade Winds* magazine showing the oxygen masks Tomlinson and the DC-1 crew wore on the Kansas City–Newark flight of September 5 that year.  
**BELOW** The DC-1, displaying its record-setter status, is prepared for another research flight. SMITHSONIAN INSTITUTION VIA AUTHOR







*Northrop 2D Gamma NC13758 before its modification for use in Tomlinson's high-altitude research programme. All three examples of the 2D Gamma were purchased by TWA for a high-speed mail service that never fully materialised in the wake of the 1934 Air Mail Emergency, when the US Army took over the transport of the nation's air mail — temporarily, as it turned out.*

the TWA engineers with additional data from the Army Air Corps' research into turbocharging.

When he began his high-altitude research, Tomlinson had fully intended to outfit the DC-1 with turbochargers, but his actual flight experience made him change his mind. On his flight from Kansas City to Newark in September, Tomlinson had run into the edge of a hurricane moving up the east coast of the USA. As he headed east from Pittsburgh, he saw ahead of him a mass of clouds rising up to 35,000ft (10,700m). This flight made him realise that for real passenger comfort, flying above 20,000ft or even 27,000ft wouldn't be enough; an airliner had to go higher. The DC-1's ceiling was around 28,000ft (8,500m) and Tomlinson wanted to go higher than this. Fortunately TWA had available a Northrop Gamma single-engined high-speed mailplane. With the data that Wright Field had given them Tomlinson and Hiestand calculated that, with a turbocharger, they could get the Gamma above 30,000ft (9,000m).

## ENTER THE GAMMA

That autumn, to gain experience flying a single-engined aircraft at high altitude, Tomlinson obtained permission to go to the Army Air Corps base at Langley Field in Virginia to fly a Curtiss P-6D, with a turbocharger, belonging to the 37th Pursuit Squadron. Tomlinson got the P-6D up to 30,000ft and found it flew well at that altitude.

Hiestand began designing a turbocharger installation for the Gamma and General Electric delivered an F-9 turbocharger to TWA early in 1936. Wright Aeronautical sent out its latest version of the Wright Cyclone, the new G series,



offering 1,000 h.p. at take-off. Through trial and error, Jim Easton, a TWA metalsmith, installed the new Cyclone with the F-9 turbocharger on the Gamma, along with an intercooler and a revised cowling. The mail compartment ahead of the cockpit was extensively modified as an observer's station by adding small windows on each side of the fuselage (as seen **ABOVE**). Metal ducts brought in hot air heated by the engine manifold.

An instrument panel was installed holding some 30 instruments to measure engine and

turbocharger performance. This, however, led to a problem in recording the data; there was no way an observer could write down data from 30 instruments simultaneously. Tomlinson's secretary came up with a solution. An avid photographer, he suggested taking photographs of the instrument panel at set intervals. Tomlinson had the TWA mechanics install his secretary's Leica camera with a flash attachment.

A liquid-oxygen system was supplied for the pilot and the observer, who inhaled the oxygen through tubes in their mouths; communication was by handwritten notes passed to each other. But the noise in the mail compartment, located just behind the engine, with no soundproofing, was deafening, so Tomlinson made many flights without an observer, using only the camera to record data.

It took several months to complete all the modifications to the Gamma, but finally, at 0935hr on the morning of July 9, 1936, Tomlinson took the Gamma into the air for a familiarisation flight with James Hiestand aboard as observer. Tomlinson immediately ran into problems maintaining fuel pressure at higher altitudes. The Gamma's fuel system would not work well above 20,000ft. It took several flights to work out a solution, which included installing larger-diameter fuel lines, moving the fuel pump to the bottom of the firewall and providing air pressure for the fuel tanks in the wing. With pressurised

fuel tanks the Gamma could get up to 35,000ft, the altitude Tomlinson wanted for his test flights.

On some of the early flights the turbocharger lost a blade which, revolving at 30,000 r.p.m., whistled through the cockpit at the speed of a

bullet, just missing Tomlinson's feet. After a second incident of blade failure, he had the mechanics put extensions on the Gamma's rudder pedals to remove his feet from the line of fire. Despite the problems with fuel pressure, these early flights helped smooth the operation of the turbocharger.

On the ninth test flight Tomlinson managed to get the Gamma up to 30,000ft without trouble. Soon after this a Hamilton Standard three-bladed propeller replaced the

Gamma's twin-bladed propeller, with a definite improvement in climb performance. With increasing confidence

in the Gamma and the operation of the engine and turbocharger, on the 13th test flight on September 9, Tomlinson took the Gamma up to 35,000ft for the first time, cruising at that altitude for 25min. At this altitude he and Hiestand experienced symptoms of oxygen starvation before beginning a quick descent, a condition they would experience again at this altitude.

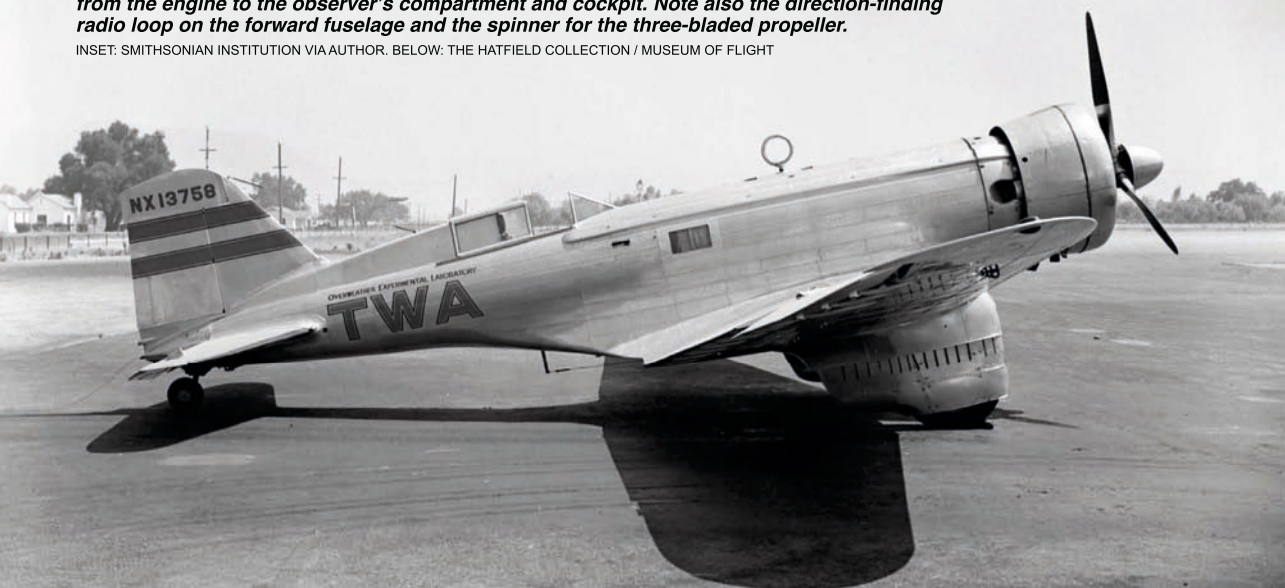
### ENCOUNTERING THE JET STREAM

On the 16th flight Tomlinson began a series of tests to check the winds at high altitude. Above 30,000ft visual navigation in the Gamma was difficult. Visibility out of either side of the



**INSET ABOVE** Tomlinson wearing one of several oxygen masks he tested while flying the Gamma. **BELOW** The starboard side of the Gamma's fuselage incorporated the heating duct from the engine to the observer's compartment and cockpit. Note also the direction-finding radio loop on the forward fuselage and the spinner for the three-bladed propeller.

INSET: SMITHSONIAN INSTITUTION VIA AUTHOR. BELOW: THE HATFIELD COLLECTION / MUSEUM OF FLIGHT







**ABOVE** Tomlinson shares a smoke with fellow TWA pilot Frank Busch, who later became the airline's General Manager of Operations and Vice-President of Flight Operations. Smoking around aircraft was clearly not an issue at the time! Note the legend on the Gamma's fuselage, which reads "Overweather Experimental Laboratory".

cockpit was poor, and the view forward was even worse. Tomlinson had to navigate by radio beam. Setting up a triangular course from Kansas City, Tomlinson followed the beam north-east to pick up the beam station at Kirksville, Missouri. He then followed the Kirksville beam south to Columbia, Missouri, picking up the Columbia radio beam to fly west back to Kansas City. Using these known distances Tomlinson could compare his indicated airspeed to his actual groundspeed, timing the speeds in order to check the speed and direction of the wind, as well as to record level speeds at different altitudes.

On these flights Tomlinson encountered the jet stream, about which little was known at the time, finding winds of 50–150 m.p.h. (80–240km/h). He made two extended flights between Kansas City and Wright Field, cruising above 30,000ft to get above the overcast, following the radio beams. On one leg his average groundspeed was calculated at 375 m.p.h. (600km/h), with a tailwind of 148 m.p.h. (240km/h).

James Hiestand, who flew as Tomlinson's observer on most of the flights, took photographs of the instrument panel at each 1,000ft (300m) of altitude and during the extended cruise periods,

resulting in the building up of a considerable amount of data.

These flights were not without risk. On the 23rd flight, from Kansas City to Wright Field, Hiestand nearly came to grief. Fortunately, he was flying with a second observer, a representative from General Electric by the name of Reeves. After flying at 30,000ft for 1hr 20min, Hiestand twisted around to turn on the second bottle of oxygen, but in doing so pulled out his oxygen tube from its connection. Before he could reconnect his oxygen tube, he became unconscious. Reeves managed to reconnect Hiestand's tube, but could not insert the tube into Hiestand's mouth because his teeth were tightly clenched. Reeves quickly inserted the tube into Hiestand's left nostril, holding the right nostril closed with his finger. He continued like this for another 30min until Tomlinson, who was unaware of what was going on, began his descent to Wright Field. Hiestand regained consciousness as the Gamma descended below 19,000ft (5,800m), but on landing had to be helped from the aircraft, quite ill.

Not surprisingly, TWA was interested in the physiology of flight and arranged for an Army Air Corps flight surgeon to make several flights



ALPHA ARCHIVE

**“NON-STOP SCHEDULES  
BETWEEN CHICAGO AND  
NEW YORK NOW MAINTAINED  
BY THE GREAT NEW TWA  
SKYCLUBS . . . DELICIOUS  
FULL-COURSE HOT MEALS  
SERVED COMPLIMENTARY  
ON ALL NON-STOP  
SCHEDULES. FLY TWA —  
THE LUXURY LINE!”**

— 1935 *TWA Skyclub Service* brochure

**LEFT** A typical pre-war promotional photograph emphasising the comfort and glamour of air travel on TWA's coast-to-coast “Lindbergh Line”.

in the Gamma to make observations relating to the stresses and strains of high-altitude flight.

The Gamma's last research flight took place on January 24, 1937. Jack Frye called Tomlinson and asked him to make a publicity flight from Kansas City to Newark. Frye wanted to exhibit the Gamma at the National Aviation Show in New York City the next day. The weather that Sunday was atrocious; a front covered much of the Midwest and East Coast. Both TWA and United cancelled their flights east of Chicago. The ceiling at Newark was supposed to hold at 1,000–1,500ft, however, so Tomlinson thought he could make it.

He took off from Kansas City in a blizzard

and climbed to 32,000ft (9,800m) to get above the cloud. As he neared St Louis he lost all radio communication through static interference, and the clouds began to rise. Soon he was flying in cloud at 35,000ft, on instruments, resorting to dead reckoning as he couldn't find a radio beam. Near Pittsburgh, Tomlinson heard a brief snatch of a radio report of breaks in the cloud over Albany, New York, so he turned north-east, finally getting some breaks in the cloud at 36,000ft (11,000m), the Gamma's absolute ceiling.

Tomlinson had now been flying blind for four hours, but suddenly he managed to pick up a radio beam from a station in Elmira, New York.

**This side view of the Gamma clearly shows the rectangular turbo-charger installation on the port side of the engine cowlings. Despite the type's chronic shortcomings in terms of the view from the cockpit, the Gamma was classically brawny in the American tradition, and was reportedly much-loved by its pilots, who found it strong and steady.**

THE HATFIELD COLLECTION / MUSEUM OF FLIGHT



*The Boeing Model 307 Stratoliner was the world's first pressurised airliner and could cruise at 20,000ft, substantially higher than the previous generation of airliners. Introduced into TWA service in July 1940, the Stratoliner represented the application of the lessons learned from Tomlinson's pioneering research flights in the DC-1 and Gamma.* ALPHAARCHIVE x 2



He followed the south-west leg of this beam, hoping to pick up the beam out of Newark. Unbeknown to Tomlinson, the winds at altitude had carried him much farther east. When he finally broke out of the storm and regained radio reception, he realised he was approximately 60 miles (95km) out over the Atlantic Ocean with 45min of fuel left. Tomlinson turned west and made for Newark, but ran out of fuel before he could reach the airport. He managed to land the Gamma in a polo field near Princeton, New Jersey. The aircraft nosed up on landing, bending one propeller blade.

He had been in the air for seven hours. A crew of TWA mechanics removed the Gamma's wings and tail and towed the machine to New York, repairing it overnight. At the opening of the show the aircraft was spotless.

### THE PROGRAMME DRAWS TO A CLOSE

Tomlinson never flew the Gamma again, having made a total of 33 flights in the aircraft, equating to more than 40hr, including more than 15hr at altitudes above 30,000ft. At the time, including his flights in the DC-1, Tomlinson probably had more flying time above 20,000ft than any other pilot. Tomlinson shared the results of his flight research with the Army Air Corps and with the aviation industry in a series of technical articles.

The results of Tomlinson's initial flights in the DC-1 convinced Jack Frye and other senior staff at TWA of the benefits of flying at higher altitudes and led directly to TWA's negotiations with Boeing for the purchase of the company's Model

## NORTHROP GAMMA DATA

**Powerplant** 1 x 710 h.p. Wright SR-1820-F3 Cyclone nine-cylinder single-row supercharged air-cooled radial piston engine

### Dimensions

Span	47ft 9½in	(14.57m)
Length	31ft 2in	(9.5m)
Height	9ft 0in	(2.74m)
Wing area	363ft²	(33.7m²)
Wing loading	20.2lb/ft²	(98.9kg/m²)

### Weights \*

Empty	4,120lb	(1,868kg)
Loaded	7,350lb	(3,334kg)

### Performance \*

Maximum speed at 6,300ft (1,920m)	223 m.p.h.	(359km/h)
Cruise speed	204 m.p.h.	(328km/h)
Climb	1,390ft/min	(7.1m/sec)
Service ceiling	23,400ft	(7,130m)
Normal range	1,970 miles	(3,170km)

\* Standard production Gamma

307 Stratoliner, the first commercial airliner with a pressurised cabin. Tomlinson knew that the Stratoliner was only an interim step, however; the real goal was commercial flights at 30,000ft and above, which he believed would come in time and with new technology. What Tomlinson had done with his flights in the DC-1 and the Gamma was to show the way forward.



# **SQUARE PEG . . .** **. . . ROUND HOLE**



***From D-Day to VE-Day: the Spitfire as divebomber***

Rightfully famous as one of the finest — and most adaptable — fighting aircraft of all time, the Spitfire was called on to perform numerous duties throughout the war. One particular role was a task too far, argues **DONALD NIJBOER**, who explores the use of the shapely fighter as a divebomber by the Royal Canadian Air Force's No 126 Wing during 1944–45





**ABOVE** Canadian armourers prepare to load a Mk III Medium Capacity 500lb bomb on to a Spitfire Mk IX of No 126 Wing RCAF. The 500lb general purpose Mk III was originally designed to be dropped horizontally and not from an aircraft in a dive.

**T**HE SUPERMARINE SPITFIRE is regarded by many as the finest single-seat fighter of the Second World War. Immortalised during the Battle of Britain and well known for its defence of Malta during 1942, the type would see action on every British front during the 1939–45 conflict. Originally designed as a short-range interceptor, the Spitfire was indeed one of the best — but, as the war situation began to change, more and more demands were placed on this elegant airframe.

As a fighter the Spitfire was legendary for its speed and manoeuvrability. Its greatest attribute, however, had nothing to do with its exceptional performance. Incorporated into R. J. Mitchell's brilliant design from the outset was its potential for continued development. What set the Spitfire apart from the Hawker Hurricane and its intended replacement, the musclebound Typhoon, was its ability to take on more grunt without degrading its performance. Indeed, every new Spitfire mark represented a simple increase in horsepower. The Mk V was essentially a Mk I with the more powerful Rolls-Royce Merlin 45 engine and the Mk IX was a Mk V with the new Merlin 61. Fortunately for the British, the Spitfire's ability to accommodate increasingly powerful engines meant they had a fighter capable of taking on the Luftwaffe's latest variants of the Messerschmitt Bf 109 and Kurt Tank's superlative Focke-Wulf Fw 190. One can only imagine what might have happened if the Spitfire's development had ended with the Mk I or Mk V.

### **JACK OF ALL TRADES**

Like many Second World War combat aircraft the Spitfire was soon modified to perform a number of roles for which it was never originally intended. Starting out as an interceptor, the type was soon modified into a long-legged escort fighter — 60 Mk IIA (LR) long-range fighters were built with a 40gal fixed tank under the port wing — a photo-reconnaissance aircraft,

**LEFT** "Left a bit" — Spitfire VZ-H of No 412 Sqn RCAF taxis out at B80 Volkel with a full bomb load of a single 500-pounder on the centreline and a pair of 250lb general purpose bombs on the wings, plus a helpful guide on the starboard wing to warn the pilot of any upcoming obstacles.



an air-superiority fighter and a carrierborne interceptor. It was even fitted with floats and tested as a floatplane fighter.

Much was asked of the Spitfire airframe and in most cases it rose to the challenge. There were two roles, however, in which the Spitfire performed decidedly poorly. The first of these was the carrierborne fighter role. Never intended for carrier operations, the Spitfire suffered from poor range and an unsuitable undercarriage configuration, resulting in a very high accident rate. Ironically, once free of the carrier deck the Seafire was considered to be one of the best low-to medium-altitude naval fighters of the war. The second role in which the Spitfire struggled was as a divebomber. Mitchell never envisioned the type as a fighter-bomber, so when the RAF considered exploring the Spitfire's potential as a divebomber, it couldn't have picked a less suitable candidate.

The evolution of the Spitfire into a divebomber began shortly after the fall of France in the spring of 1940. Although convinced that a robust bombing campaign would win the war, the RAF quickly realised that air support for the army would also have to be improved. Developments in North Africa would contribute to the air support question too. After two failed attempts to relieve the Libyan port of Tobruk in May and June of 1941, Air Marshal Arthur Tedder and Gen Sir Claude Auchinleck moved ahead with a

series of exercises designed to solve the problem of air support for ground forces. This would lead directly to the formation of the Allies' Desert Air Force (DAF) — later known as the First Tactical Air Force (1TAF) — and the first time Spitfires would carry bombs.

By early 1943 planning for Operation *Overlord* — the D-Day invasion — was well advanced. Both the RAF and the British Army were finally singing from the same hymn sheet and fully endorsed the formation of the RAF's Allied Expeditionary Force (AEF) in May 1943. By November it had been renamed the 2nd Tactical Air Force (2TAF) and included No 2 Group, transferred from Bomber Command, and Nos 83, 84 and 85 Groups. The vast majority of the aircraft used by 2TAF were single-seat Spitfire IXs and Typhoon IBs. While the Spitfire IX was an exceptional fighter, it was completely ill-suited for the ground-attack role.

At this stage of the war the ineffectiveness of the 0.303in-calibre machine-gun was well known. While the 20mm cannon was an effective weapon against aircraft and most ground targets, the Spitfire's ground-attack capabilities were severely limited by its light gun armament. This was recognised by the authorities, and before the D-Day invasion there was a big push to upgrade the Spitfire's armament to two 20mm cannon and two 0.50in machine-guns. An official loose







minute, dated March 29, 1944, describes the urgency at the time.

#### ***"0.50in Browning Guns in Spitfire Aircraft***

*"At the Commanders' meeting this morning the AOC-in-C [Air Officer Commanding-in-Chief] directed that every possible effort was to be made to get into service in the shortest possible time the maximum number of aircraft with the above armament. He also described [sic] that 2TAF was to ensure that adequate stocks of ammunition of the right type were provisioned. The AOC-in-C said that this retrospective conversion was to be given high priority; it will mainly involve the Senior Technical Supply Office as soon as the appropriate technical leaflet has been published."*

Another loose minute, dated March 12, 1944, reveals figures relating to the number of Spitfires already converted, and those coming off the production lines:

#### ***"Spitfire with 0.50in Guns***

*"Air Commodore Battle, Chief Overseer, Ministry of Aircraft Production, rang to say that anticipated deliveries of 0.50in Spitfire installations are as follows: For retrospective fitting — 80 sets in April and 80 sets in May. Off production already, 60 fitted in aircraft in March, 80 in April and 280 in May."*

***Each armed with a single 500lb bomb on the centreline, four Spitfire Mk IXs of No 401 Sqn RCAF prepare to take off on another divebombing sortie. The unit operated from RAF Tangmere in the run-up to D-Day, moving to the airstrip at B4 Beny-sur-Mer, near Caen in Normandy, on June 18, 1944. The standard Mk III 500lb bomb used on these sorties had a diameter of 13in (33cm) and a total length, including the tail, of 69in (175cm).***



In many respects the Spitfire IX was lightly armed when compared to the Typhoon, Republic P-47D Thunderbolt, Lockheed P-38J Lightning and North American P-51D Mustang, all of which would see action as divebombers and/or fighter-bombers. All would eventually be equipped with bombs and here again the Spitfire was found wanting (see page 35 for a comparison). All of the above fighters were capable of delivering at least 2,000lb (907kg) of bombs, whereas in late 1944 the Spitfire was only cleared to carry a 1,000lb (455kg) load. This, along with restricted range, limited 2TAF's Spitfires to targets that were in the immediate battle area, often forcing them to attack targets within range rather than by priority.

#### ***THE DIVEBOMBING CANADIANS***

One of the Spitfire-equipped groups heavily involved in both the air superiority role and divebombing duties was No 126 Wing of the Royal Canadian Air Force, made up of Nos 401, 411 and 412 Sqns RCAF. From D-Day to VE-Day it was the most successful Fighter Wing on the Continent, boasting a total of 333 enemy aircraft shot down. While its aerial victory record was spectacular, the Wing's divebombing activities were somewhat less so. For the pilots of No 126 Wing, divebombing activities had started well before the D-Day landings. In April 1944 the Spitfires of No 126 Wing began divebombing attacks on V1 flying-bomb *Noball* sites in France. Flight Lieutenant Bill McRae of No 401 Sqn takes up the story:

"In April 1944, after a short divebombing course at Fairwood Common in Wales, where we used only small smoke bombs, we moved from Biggin Hill to Tangmere and began divebombing as part of our regular duties. The Spitfire had been used as a divebomber in the Mediterranean theatre, but I believe only two wing-mounted 250lb [115kg] bombs were used there. In Normandy No 401 Sqn carried only the belly-mounted 500-pounder.

"The targets assigned to us — mainly V1 launching sites and, occasionally, small railway bridges — required pinpoint accuracy, something almost impossible to achieve with the technique recommended for releasing belly-mounted bombs from a Spitfire; to start the pull-out before releasing. Only once in my logbook do I mention the squadron having achieved a significant number of hits."

Operational Research studies made in the run-up to D-Day clearly showed that bombs dropped from fighters in a dive were found to hit a viaduct 500yd (1,500ft/455m) long and 8yd (24ft/7m) wide just once in 82 attempts (although the report does not specify what type of fighter was used). Near misses did little damage.



**LEFT** *The Second Tactical Air Force's "cab rank" strategy, in which aircraft on standing patrol could be called in at a moment's notice to attack pinpointed targets, proved highly successful during the Battle of the Falaise Gap in August 1944, as this German motorised column found to its cost.*

**BELOW** *Canadian groundcrew pose alongside bomb-armed Spitfire Y2-L of No 442 Sqn RCAF at B88 Heesch, south-west of Nijmegen in Holland, in January 1945. The unit moved back to the UK to re-equip with Mustangs two months later.*

One of the Spitfire's greatest assets was its speed, but when in a dive this was also a problem. None of the Allied fighters used as divebombers were modified to accommodate divebrakes, which allowed a divebomber to maintain a set speed during a dive, thus increasing bombing accuracy. When a Spitfire dives it gains speed rapidly, with no way to slow it down. It also revealed a new and strange phenomenon, as Bill McRae relates:

"The first indication of problems came when our crews began painting white and yellow lines on the inboard chord of the ailerons. This, we were told, was to enable us to watch for and take action in the event of 'aileron up-float'. This phenomenon had been known to the brass for at least a year, but it was news to us.

"Apparently, at high speeds both ailerons would rise, or float, and if allowed to continue could theoretically reach the point where they would break off. When first discovered on the Mk V, a suggested solution was to droop both

aileron 5° in at rest, so they could rise to neutral at high speed.

"We were told to monitor the ailerons as the speed increased; if the white line appeared you were approaching the critical point, if the yellow line showed you were to slow down. At the same time we were supposed to keep the airspeed below the  $V_{ne}$  [never-exceed speed]. Obviously we were far too busy trying to keep the target in sight, with red and white balls [anti-aircraft artillery] going past us in the opposite direction, to be checking the ailerons and the airspeed while in the dive, so both of these limiting factors were simply ignored. Reaching an indicated airspeed of 500 m.p.h. [800km/h] was not uncommon."

While the RAF had fully embraced the dive-bombing technique, it did nothing to modify or equip either the Spitfire or Typhoon for the role. No proper divebombing sight was used, the bomb-racks fitted to the aircraft were designed for level-bombing and the bombs themselves

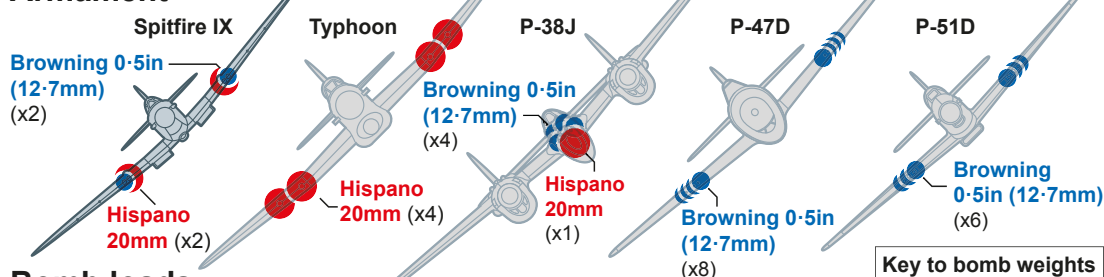




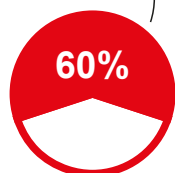
# The “Spitbomber” – a role too far?

Comparing the Spitfire IX with other Allied fighter-bombers of the era hints at its weaknesses as a divebomber

## Armament

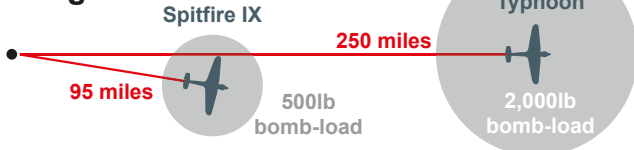


## Bomb loads



60 per cent of all Spitfire accidents with a full bomb-load were due to burst tyres because of excessive weight

## Range

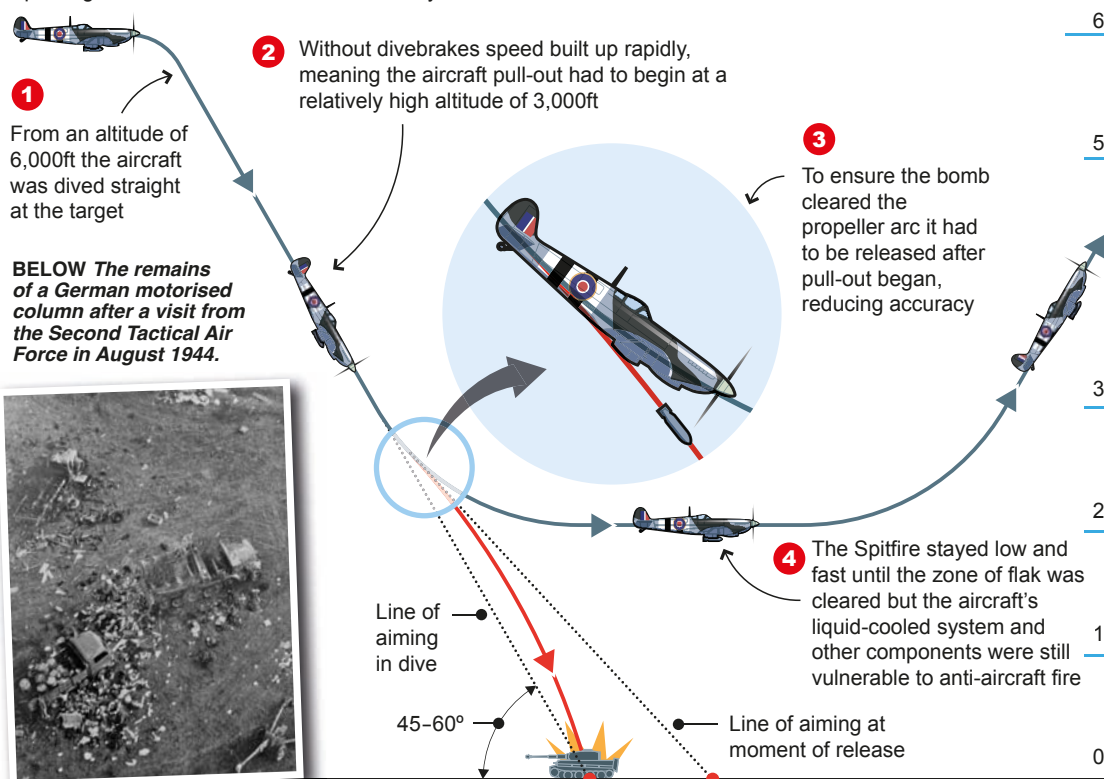


## Specified Spitfire divebombing methods

Graphic: Ian Bott ([www.ianbottillustration.com](http://www.ianbottillustration.com))

A look at the officially-prescribed method of divebombing a target in a Spitfire gives more clues as to its unsuitability for the role

Altitude (’000ft)





**ABOVE** Flight Lieutenant William R. McRae beside a Spitfire during his tenure with No 401 Sqn RCAF. Born in Scotland in 1919, Bill moved with his parents to Canada in 1922. After training on Tiger Moths and Harvards, he gained his wings in Canada in April 1941.

were designed to be dropped from a lumbering four-engined bomber flying horizontally. And when a Spitfire was fitted with a single centreline-mounted 500lb bomb, the pilot was forced to pull up before releasing his bomb, thus degrading his accuracy. If he did not do so, the bomb would not clear the propeller arc. In a dive a Spitfire could exceed 450 m.p.h. (725km/h), putting the bomb-release point above 4,000ft (1,220m). Bill McRae describes the physically taxing pull-up manoeuvre and how it could prove deadly:

"On my first divebombing show I went through the procedure, pulled out with great difficulty, blacked out, [and] recovered back up about where I started. I believe the training we had with small smoke bombs was inadequate, especially since we were not told what to expect when dealing with the real thing. Consequently, we each had our own idea of how to go about it.

"Initially I trimmed for the dive then tried to trim out while pulling out of the dive. It usually took both hands on the stick, pulling with all my strength to get out of the dive. A day later I watched as another of our pilots appeared to be pulling out, then the dive steepened, past the vertical and he ploughed right into the ground."

Flak and small-arms fire also took a heavy toll. The Spitfire's liquid-cooled Merlin engine was extremely vulnerable to light flak. A single bullet in the oil and/or glycol tanks or radiator would often spell the end. The numbers speak for themselves; from D-Day to VE-Day, No 126 Wing lost 131 Spitfires, with 98 pilots killed or captured, all mostly owing to flak.







The freefall bombs of 1943–45 were also highly inaccurate. Even the fabled “tankbusting” Typhoon shared the same fate. In a report dated June 10, 1944, the AEF’s Operational Research Section published a study of the effectiveness of fighter-bombers (namely Spitfires and Typhoons). It revealed that the Typhoons were neither more nor less accurate than the Spitfires. The only difference was that the Typhoon was capable of carrying two 500lb bombs to the Spitfire’s one, making it twice as useful. Later, Spitfires would carry one 500lb and two 250lb bombs.

The results of the post-D-Day divebombing campaign were disappointing. Against such targets as bridges it was necessary to fly 90–180 Spitfire bombing sorties or 45–90 with Typhoons before substantial damage was inflicted (the Typhoon’s ability to carry two bombs halved the number of sorties). It was also proven that when targets were defended by flak and small-arms fire accuracy decreased even more.

### THE RAF AND “REPURPOSING”

To be fair to the Spitfire, all of the Allied fighter-bombers suffered from the same difficulties when it came to using divebombing techniques. Against fixed positions, fighter aircraft used as divebombers were largely ineffective. When the German forces were in headlong retreat, however, tactical air power proved devastating. During the Battle of the Falaise Gap in August 1944 and the German retreat across the Rhine in early 1945, traffic congestion provided a target-rich environment. Allied air attacks

caused considerable damage; add the panic and confusion caused by the relentless attacks and the results were completely demoralising for German ground forces.

When the numbers are analysed 2TAF dedicated only one third of its sorties in direct support of ground troops. The remainder was dedicated to other roles such as the establishment of air superiority, cutting French and German rail communications and attacking targets in Germany. These interdiction missions were arguably the most effective contributions made by 2TAF during the war in Western Europe.

As much as the RAF embraced the concept of tactical air power and the divebombing technique, the acquisition of a purpose-designed aircraft for the role was never seriously considered. The use of the Spitfire was a largely unsuccessful attempt to make an interceptor into a divebomber. It was inaccurate and too delicate for the job.

When 2TAF was formed the obvious source of aircraft was RAF Fighter Command, overwhelmingly equipped with Spitfires. While the Typhoon did gain a reputation as an effective ground-attack aircraft, it was, statistically, no more accurate than the Spitfire. One of the obvious choices for a suitable aircraft would have been the North American A-36 divebomber, an early Allison-engined variant of the P-51 Mustang. Proven in Italy in service with the USAAF, it was overlooked by the RAF and was eventually replaced by the P-47 Thunderbolt in USAAF service in 1944. One can only speculate as to how effective two or three Wings of A-36s would have been during the long ground campaign into Germany during 1944–45.

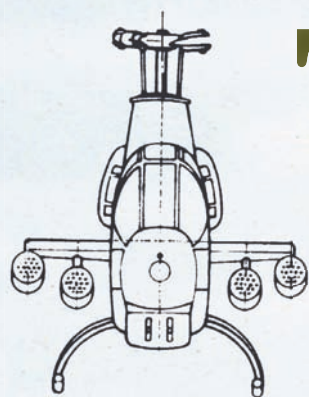
For Flt Lt Bill McRae and the pilots of No 126 Wing it had been a long slog. From D-Day to VE-Day the Wing had dropped 4,426 x 500lb bombs and 3,883 x 250lb bombs. It would go on to claim 4,468 vehicles destroyed or damaged, 493 locomotives blown up or disabled, 1,569 rail trucks in flames or holed and 426 rail interdictions. These are impressive numbers, but the last word on the “Spitbomber” should go to Bill McRae:

“In my opinion our efforts at divebombing were almost a complete failure; we were unable to achieve the precise bombing that our small targets called for. Had we been given area targets, such as marshalling yards or troop concentrations, we could have made a greater contribution.”



*Examples of the two principal fighters which served in the Second Tactical Air Force during 1944–45 — the Spitfire and Hawker Typhoon — sit side-by-side at B4 Beny-sur-Mer in Normandy, with the distinctive spire of the Church of Our Lady of the Assumption in the nearby village as a backdrop. The Spitfire, coded VZ-Z, belongs to No 412 Sqn RCAF, while the unidentified Typhoon undergoes field maintenance on its Napier Sabre engine.*

**ACKNOWLEDGMENTS** The author would like to thank the late Bill McRae and Vintage Wings of Canada (visit [www.vintagewings.ca](http://www.vintagewings.ca)) for their invaluable help with this feature. For more info on the author’s e-book on the exploits of the Royal Canadian Air Force’s No 126 Wing during 1944–45 — The Illustrated History of No 126 Wing RCAF: D-Day to VE-Day — visit [www.donaldnijboer.com](http://www.donaldnijboer.com)



# THE SCARFACE KLAN

**THE BELL HUEYCOBRA & HML-367 IN VIETNAM, 1969-71**





When US Marine Corps helicopter unit HML-367 — “The Scarface Klan” — exchanged its Bell UH-1E Hueys for the same company’s altogether more formidable AH-1G HueyCobra in late 1969, it lost no time in getting to grips with the famously fearsome helicopter gunship. **WARREN E. THOMPSON** profiles the unit’s 18-month campaign in Vietnam and explains why “when you’re out of Scarface, you’re out of guns . . .”



**I**N EARLY DECEMBER 1969 US Marine Corps (USMC) helicopter unit HML-367 moved to Marble Mountain, south of Da Nang in Vietnam, where it gave up its Bell UH-1Es and took on a full complement of the same company’s AH-1G HueyCobra gunships. This move put the squadron in the heavy firepower mode, with the ability to fire a devastating load of 2-7.5in rockets along with a turret-mounted 7-62mm minigun and, when needed, a stub-wing-mounted 20mm cannon.

Formed in March 1968 when Marine Observation Squadron VMO-3 was redesignated as Marine Light Helicopter Squadron HML-367, the unit used the callsign *Scarface*, much better reflecting its new aggressive role than VMO-3’s original *Oakgate* moniker, used during 1966 and the first half of 1967. With the delivery of 24 AH-1Gs in December 1969, HML-367 was ready to begin operations — its helicopters would support just about every type of rotary-wing operation then being flown by the US Marines. There were also numerous missions flown in support of the US Army and Korean Marines.

### POINT-BLANK FIREFIGHTS

The commanding officer for all USMC helicopter operations in Vietnam was Col Haywood R. Smith of Marine Aircraft Group 16 (MAG-16). Having completed his tour in Vietnam in 1970, Smith had the following to say about the “Scarface Klan”:

“I flew many missions with HML-367 in AH-1Gs and I firmly believe that the ‘Cobra was the best close-air-support weapon when it came to covering the insertion and extraction of friendly troops into hostile territory. Lieutenant-Colonel Harry Sexton was ‘367’s commanding officer during my tenure and he was one of the best leaders that served under my command.

BARRY PENCEK VIA AUTHOR

*A Bell AH-1G HueyCobra of HML-367 closes in on a suspected Viet Cong hideout in 1970. The HueyCobra incorporated the powerplant, transmission system and rotor of Bell’s tried-and-trusted UH-1C Huey, the new dedicated gunship variant making its first flight on September 7, 1965, a mere six months after development had started.*



"The main reason the 'Cobras were so effective was that they had the longest loiter-time over a hot area and they backed it up with some awesome firepower. Every one of the pilots in the squadron experienced a point-blank firefight with Viet Cong [VC] and North Vietnamese Army [NVA] troops on a regular basis. It is my belief that the 'Cobra was probably the most respected and feared weapon by the VC and NVA regulars during the war."

Smith continued: "No matter what their mission was, you could be assured that they were going to drum up a lot of groundfire. In early June 1970, '367 became involved in a unique mission that called for tactics quite different from those it was used to. A few days before the missions, one of our recon teams was able to capture a Viet Cong prisoner. Once they put him through a lengthy interrogation session, he talked and revealed where the HQ of the VC was in the Que Son mountains. This was a mountainous area laced with caves. We attended several high-level meetings to determine the best way to attack the target. The final plan called for 16 Sikorsky CH-53Ds. However, with this large an attack force, it only required one heavily-armed 'Cobra from HML-367."

This mission would result in one of the longest flights — 5hr 48min — flown by a CH-53 during the Vietnam War, the average being around 3hr. Each of the big helicopters was loaded with 15 x 55 US gal drums of napalm, equating to some 6,000lb (2,700kg) of napalm per helicopter or a grand total of 96,000lb (43,500kg) for the full attack force. The final plan called for the CH-53Ds to hover above the cave complex and drop their loads simultaneously, at which point the HueyCobra was called in with its 54 x 2.75in



COL. HAYWOOD SMITH VIA AUTHOR

**ABOVE** Colonel Haywood Smith, Commanding Officer of MAG-16 and all US Marine Corps helicopter operations in Vietnam, smiles for the camera beside one of the "Scarface Klan's" HueyCobras.

rockets. Seconds later, the rockets hit home and the entire area erupted in a massive fireball. The VC Commanding General of I Corps, along with a undetermined number of VC troops, was killed. This tactic was not used many times, but it was the heavy-hauling CH-53s and firepower of the HueyCobra that made this type of mission so successful.

**A "snake" (HueyCobra) of HML-367 and a pair of US Marine Corps Boeing-Vertol CH-46s — nicknamed "Phrogs" in service owing to the type's appearance of squatting like a frog when on the ground— await the passing of a thunderstorm at Marble Mountain before undertaking a mission to drop USMC forces deep into enemy-held territory.**

BARRY PENCEK VIA AUTHOR





**ABOVE** *Spelling it out — the unit's nickname is written in ammunition on the hangar floor at HML-367's base at Marble Mountain. This head-on view shows the devastating firepower that each HueyCobra had at its disposal. The front turret is a standard M28 unit, equipped with a 40mm grenade launcher to port and an M134 minigun.*

The HueyCobra was used in many ways by the USMC during the Vietnam War, dynamically changing the posture of the North Vietnamese and their tactics against American ground and air units. As former HueyCobra driver Capt "Skip" Massey explains, "to be a 'Cobra pilot, it was necessary to perform the following duties: airborne forward air control; close air support; medevac escort; helo resupply escort; BDAs [bomb-damage assessments]; recon insert and hunt-and-destroy missions". There was a progression of experience required to become a section leader — mission commander of two 'Cobras — or division leader, when several AH-1Gs were used.

First Lieutenant Roland Scott recalls a dangerous mission in Vietnam's Quảng Nam province in July 1970:

"I was a section leader of two 'Cobras, escorting two [Boeing-Vertol] CH-46 transports. We launched at 1500hr to extract a Marine reconnaissance team that was in contact with a numerically superior enemy force. After being briefed by a [North American Rockwell] OV-10, the team was in the process of moving down a small riverbed to a suitable helicopter-landing zone. This was accomplished under the cover of fixed-wing airstrikes on enemy positions. The OV-10 pilot warned the team that a thunder-

storm was approaching from the south.

"The CH-46s dropped their teams on a sandbar, the aircraft retreating from the area owing to the storm. Within a few minutes the team radioed that it was surrounded by the enemy on all four sides."

Scott turned and flew directly into the low cloud and rainstorm to help. He instructed his wingman to remain with the two CH-46s that were circling north of the rainstorm. Locating the team's position, Scott had to fly at a speed of 40–50kt (75–95km/h) at 20–50ft (6–15m) above ground level, making numerous attacks against the enemy forces using his 20mm cannon while only 100ft (30m) from the friendly force.

Scott also used his 7-62mm M134 minigun while only 50ft from friendly forces. The rainy weather continued to move out of the area and, with Scott's HueyCobra keeping the enemy pinned down, the CH-46s were able to get in and pick up the team. Meanwhile, Scott marked the enemy positions with phosphorous rockets. In recognition of his leading the charge to recover the team, Scott was awarded the Silver Star.

### 'COBRA BECOMES KINGFISHER

Almost immediately after converting to the HueyCobra, HML-367 became involved in *Kingfisher* missions, in which the unit





**ABOVE** The port stub wing of this HML-367 AH-1G, adorned with an appropriate Cobra motif on the nose, is fitted with a 19-tube M159 2-75in folding-fin aerial rocket (FFAR) launcher inboard, with an M158 seven-tube FFAR launcher on the outboard hardpoint. **BELOW** HueyCobras of HML-367 in their revetments at Marble Mountain.

aggressively searched out enemy troops before they had a chance to initiate a planned action. *Kingfisher* teams usually consisted of a rifle platoon, three CH-46s, two HueyCobras and an OV-10 plus a single UH-1E for primary command-and-control operations.

The idea was that the HueyCobras would be the “kingfishers”, waiting above the assault team; when the enemy showed itself, the predators would pounce. The AH-1G’s fuselage was a mere 36in (91cm) wide, with the pilot and copilot/gunner located in tandem. This gave the helicopter an extremely narrow head-on profile, a minimal cross-section and exceptional visibility from the cockpit. In addition, the type’s stub wings were designed to carry a variety of

state-of-the-art ground-attack weapons; these accumulated features made the HueyCobra the most valuable support aircraft in Vietnam.

According to former HueyCobra pilot Lt Deane Swickard, “we had a top speed of around 220 m.p.h. (355km/h). The stub wings could hold [four 19-barrelled M159] 2-75in-rocket pods or [two rocket pods and] a [single M195 Vulcan] 20mm cannon. The six-barrelled [M195] Gatling gun fired 2,000 or 4,000 rounds per minute. This weapon alone could cut down a 100yd [90m] swathe of thick-jungle hiding-places for the NVA. Although the *Kingfisher* attack group was tasked with getting in and out quickly, the enemy bodycount after a close-in firefight must have been extremely high.

BARRY PENCEK VIA AUTHOR







**ABOVE** This view from the cockpit of an HML-367 HueyCobra was taken while protecting a CH-46 resupplying a remote USMC outpost — note the shadow of the “Phrog” on the slope facing the camera. Such resupply missions required acute vigilance from the Cobra, as the incoming helicopters were extremely vulnerable to groundfire.

“The pilot normally fired the wing stores and flew the aircraft, although the copilot/gunner also had flight controls and could fire the guns in the nose turret. When rockets were launched, turret fire was automatically interrupted. On *Kingfisher* missions, the ‘Cobras’ would normally launch with two seven-shot rocket pods with ‘Willy Pete’ [white phosphorous — WP] warheads, two 19-shot rocket pods with 17lb [7.5kg] high-explosive [HE] warheads, a minigun turret armed with 4,000 rounds and a [wing-mounted] 20mm cannon with 300 rounds.

“Normally the crew would visually acquire a target, mark it with WP and attack it with HE rockets and high-volume fire from the other guns. Our ‘Cobras’ were protected by 272lb [123kg] of armour. Research had shown where the armour should be put so that the engine compressor, fuel controls and crew seats were protected. Self-sealing fuel tanks, redundant hydraulics and an emergency oil-bypass system were also included. These features, combined with firepower, speed and profile, resulted in a potent gunship with high crew survivability.”

Considering the low altitude at which the HueyCobras operated — often at treetop level — it is surprising how few were lost. Viet Cong and NVA soldiers put up a constant barrage of groundfire against the invaluable ‘Cobra. For the Scarface Klan to be fully effective, the unit’s HueyCobras had to stay low, especially during the exfiltration of troops using the larger

helicopters. Lieutenant Bob “Robby” Robinson recalls such a mission:

“The temperature in March was running over 100°F [38°C]. In that kind of heat, a loaded ‘Cobra’ would struggle to get airborne; [it] would start its take-off down the runway while struggling to gain enough airspeed to enter translational lift. Many a pilot had to clean his pants after watching a fence or other obstacle at the end of the runway get bigger and bigger.

“On one flight that had us heading back towards Marble Mountain we heard an OV-10 talking to DASC [Direct Air Support Center]. He was looking for some guns as quick as possible. He had seen several VC run into a bunker and wanted to roust them out. His position was about 6km [four miles] south of Marble and we were only 10min away. We arrived overhead while the OV-10 was circling at 3,000ft [900m].

“He said the bunker was just north of the river and west of a large clump of trees and marked the location with a round of ‘Willy Pete’. We lined up behind the OV-10 to get a good line of fire with our rockets. His marker hit close to the top of the entrance and he stated that my target was 50m [160ft] east of his mark. We lined up and I set up two rockets and fired; as they hit I lined up the crosshairs.

“I didn’t want to make the ‘snake’ jerk when everything was ready. The opening in the bunker was in my sights and as I slowly squeezed the button on the cyclic, the ‘Cobra’ jerked slightly as



**ABOVE** An armorer loads the 7-62mm M134 minigun on the starboard station of the M28 nose turret. The minigun, a Gatling-style machine-gun with electrically-operated rotating barrels, was a scaled-down version of the M61 Vulcan 20mm cannon; the M134 was capable of delivering up to 4,000 rounds per minute without overheating.



**ABOVE** This view from an HML-367 HueyCobra's "office" shows the comparatively simple instrumentation in the gunship's cockpit. The instruments show the helicopter climbing through 4,000ft at 74kt; the apparently high altitude is deceptive, however, as much of the unit's work involved weaving through the Annamite mountains.





**ABOVE** Captain Robert W. “Robby” Robinson was one of the Scarface Klan’s “top-timers”, having completed some 1,140 combat missions by the time the unit was rotated out of theatre. Robinson later published a highly-readable account of his experiences with the unit in Vietnam, entitled *Scarface 42* (Tailwind Publications, 2008).

the two rockets launched from their tubes. Straight as an arrow, the two rockets sped towards the bunker opening. I must have done everything right. I adjusted the crosshairs on my sight; the impact area was just above the target. I fired the next two rockets and, to my amazement, one of them went right into the small hole that the VC had used to enter the bunker. I pulled the cyclic back and started my climb, straining to see what damage had been done. A beautiful orange mushroom secondary explosion erupted from the bunker. It was an impressive sight and after we had expended our ordnance we headed back to Marble Mountain.

“From that day on, I considered myself a master at shooting rockets. It took probably another 500 rockets to be really good consistently, but I did become a master in delivering them right where I wanted them.”

### OUT IN THE OPEN

One of the lowest-level roles that HML-367 undertook while in Vietnam was the *Pacifier* mission, the purpose of which was to flush out potential targets into the open and take prisoners if possible. The HueyCobras usually worked such missions in pairs, in concert with three UH-46 troop-carriers. Lieutenant-Colonel Bob Guay, a pilot in MAG-16, flew regular *Pacifier* missions and recalled:

“On one of these missions the squadron CO, Lt-Col Harry Sexton, almost shot me down. I had spotted two boats crossing a stream. I went over to one to see who and what was in the boat. There were two young males and some packages. We were in ‘free-fire country’ and I was about to tell Sexton to go ahead and shoot the boat when he called me to get out of his way. He was in his gun-run and he sank the boat.

“Shortly after, I was coming out of Marble Mountain with two ‘Cobras and some troop-carrying UH-46s, on my way to pick up some officers, when I spotted a farmer working in a rice paddy. This ‘farmer’ had command presence and football-player’s legs — in other words he didn’t have anything to do with farming!”

“I told one of our ‘Cobras to stop him by firing in his direction and had one of our UH-46s pick him up and take him as a prisoner. On interrogation, we found out he was a North Vietnamese Major.

“A few days later I spotted another man walking up one of the roads and he didn’t look like a local. His clothes were spotless and he glared at me as I went by him at 10ft [3m]. I flew many of my *Pacifiers* at 10ft at a speed of around 60–80kt, as I liked to look into their eyes. As he came up to a rice paddy trail, he turned right off the road and started out into the paddy heading toward the mountains. I told one of the gunships





BARRY PENCEK VIA AUTHOR

**ABOVE** A 'Cobra of HML-367 peels away towards the base at Marble Mountain after a lengthy patrol. The unit returned to Vietnam in the spring of 1975, its UH-1Es participating in the evacuation of Vietnamese and Cambodian refugees during the fall of Saigon. In 2009 HMLA-367's Bell UH-1Y Venoms deployed to Afghanistan.

to stop him and a UH-46 picked him up. He turned out to be the second-highest-ranking officer in the NVA's I Corps.

"A few days later we were working the same area and I noticed a girl about 100yd away in a rice paddy. She had a 'diddy pole' on her shoulder equipped with two packages at either end. As one of our UH-46s approached her, she dropped the pole and started to run. They got her and let some troops out to recover the packages. It turned out that she was a VC courier and had \$100,000 in piastres."

Pacifier missions picked up numerous VC and NVA soldiers, who then provided much valuable intelligence; in most cases, the 'Cobra did not have to fire a single shot. By 1970 HML-367 was operating at full capacity and, on April 24 of that year, the unit could boast of having all 25 of its AH-1Gs fully operational — the first time a helicopter squadron had attained 100 per cent serviceability in Vietnam. As a celebration, all 25 HueyCobras were put up for a formation flight over Marble Mountain. By the end of the 1970 fiscal year the unit had flown some 22,378hr.

In June 1971 HML-367 completed its combat tour in Vietnam and relocated to Okinawa, shortly thereafter re-equipping with Bell UH-1Es. Today, the "Cobra" name continues on in US Marine service with the twin-engined Bell AH-1W SuperCobra, which looks set to remain in service with the US Marines for the foreseeable future.



## BELL AH-1G HUEYCOBRA DATA

**Powerplant** 1 x 1,400 s.h.p. Lycoming T53-L-13 shaft turbine (derated to 1,100 s.h.p.)

### Dimensions

Length (fuselage)	44ft 5in	(13.54m)
(overall inc. rotor)	52ft 11½in	(16.15m)
Width (fuselage)	36in	(0.91m)
Height (overall)	13ft 5½in	(4.1m)
Stub-wing span	10ft 11½in	(3.34m)
Rotor diameter	44ft 0in	(13.41m)
Disc area	1,520ft²	(141m²)
Skid track	7ft 0in	(2.13m)

### Weights

Empty	5,288lb	(2,399kg)
Fully loaded	9,500lb	(4,309kg)

### Performance

Maximum diving speed	219 m.p.h.	(352km/h)
Cruise speed	196 m.p.h.	(315km/h)
Hovering ceiling (IGE)*	7,200ft	(2,195m)
(OGE)**	4,500ft	(1,370m)

\* In ground effect on an 80°F (27°C) day with fuel for typical 115-mile (185km)-radius mission + fuel reserve + 38 x 2.75in rocket projectiles and 8,000 rounds of ammunition

\*\* Out of ground effect as above

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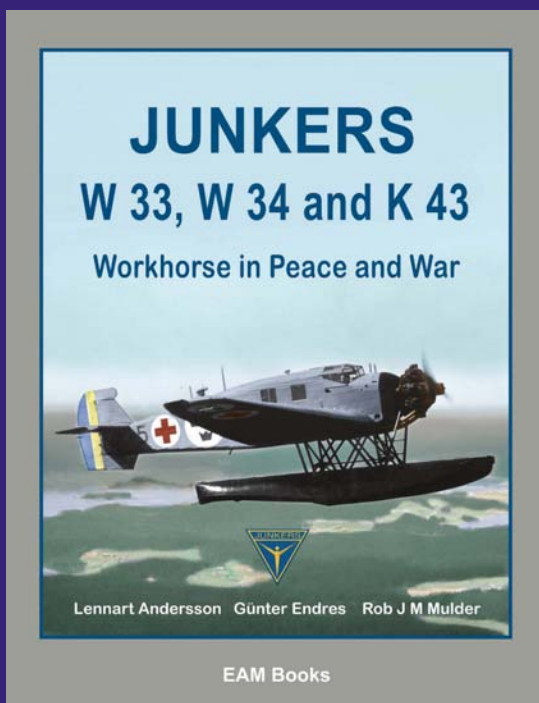
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GÜNTER ENDRES - LENNART ANDERSSON - ROB MULDER



One of Britain's most respected aviation journalists and authors, John Stroud (born April 3, 1919) joined Imperial Airways aged 14. Six years later he became a freelance aviation writer and in 1963 was appointed General Editor of the definitive Putnam series of aeronautical books. Also a talented photographer, John continued to contribute articles to the British aviation press until his death in March 2007. In 2014 a substantial part of John's archive, including numerous rolls of previously unseen 35mm film, was acquired by A Flying History Ltd and forms the basis of this new regular *TAH* series

## The John Stroud Archive

# OVER THE PASS AND DOWN THE VALLEY...

In February 1962 John was in the right place at the right time to bag a seat on the first route-proving flight of a Pakistan International Airlines Douglas DC-3 into the remote mountain airstrip at Chitral, buried deep in a valley in the Hindu Kush . . .



**O**N FEBRUARY 18, 1962, Douglas C-47B/DC-3 AP-AJT made the first proving flight of Pakistan International Airlines' challenging twice-weekly service from Rawalpindi through the 12,100ft (3,690m)-high Lawarai Pass to Chitral, located in a deep valley surrounded by the towering mountains of the Hindu Kush. On hand was intrepid aviation journalist John Stroud, halfway through an extensive tour of the Indian subcontinent, from where he was fielding regular reports in his capacity as a roving journalist for British weekly magazine *Flight*.

Formed as a corporation of the Pakistani state in March 1955, Pakistan International Airlines (PIA) traced its heritage back to the establishment of Orient Airways in October 1946, when a pair of brothers, wealthy textile industrialists Merza Ahmad and Merza Abol Hassan Isphani, acquired a fleet of C-47s from the plentiful supply





*The arrival of Douglas C-47B AJ-APT causes a sensation among the locals at the remote airstrip at Chitral on February 18, 1962. The aircraft was built at Douglas's Oklahoma City factory with the USAAF serial 43-49607, but was delivered to the RAF in December 1944 to serve as Dakota IV KK177 in India with Nos 194 and 76 Sqns. It remained in India after the war, becoming AP-AEI with Orient Airways in 1949 before being transferred to PIA in March 1955 to become AP-AJT and named City of Rawalpindi.*



left over in the region after the war. Initially employing foreign pilots and engineers, Orient began operations with a service from Calcutta to Rangoon via Akyab on June 30, 1947, and quickly established a reputation for maintaining the service regardless of the frequently atrocious weather conditions.

Following the creation of Pakistan as an independent Muslim state after the partition of India in August 1947, Orient moved its headquarters from Calcutta to Chittagong in East Pakistan (now Bangladesh), and again to Karachi in West Pakistan within a matter of weeks. The airline provided crucial relief operations during the aftermath of partition, its small fleet of C-47s and Beech 18s keeping the resulting migration supplied with vital food and shelter.

In October 1947 regular services between West and East Pakistan were established and by early 1949 Orient's C-47s were plying their trade to Gilgit and Skardu, high up in the mountains of north-west West Pakistan, on behalf of the Ministry of States and Defence. The need to supply such remote sites was twofold: first, it was a social service, keeping even the most isolated communities abreast of national news and supplied with sundry items; equally as important, it was a tactical statement by Pakistan, which was determined to retain sovereignty over the region of north-western Kashmir in the face of Indian sabre-rattling claims to the territory.

In the spring of 1949 Orient acquired three twin-engined Convair 240s, putting them to work on the Karachi—Delhi—Calcutta—Dacca route from the beginning of that May, the airline becoming the first to use the Convairliner in Asia. A series of accidents, however, along with the Pakistani government's desire to establish a national state-owned flag-carrier, spelled the end of Orient, which was subsumed into the newly-minted PIA in October 1953. The latter had been formed as a department within Pakistan's Ministry of



Defence in 1951 — and, although it operated no services at the time, the new organisation lost no time in ordering three Super Constellations from Lockheed. These Model 1049Cs were duly delivered and put into service on the Karachi—Dacca route from June 1954 and on the Karachi—Bombay route from that December. By February 1955 the Connies were flying the fastest times on the competitive Karachi—Cairo—London route.

The young airline continued to expand, with Vickers Viscounts joining the growing fleet in 1959, and in 1960 PIA became the first jet operator in Asia, having leased a Boeing 707 from Pan

**ABOVE RIGHT** One of PIA's first Boeing 720s, AP-AMG, photographed by John at Rawalpindi before his DC-3 flight to Chitral. **BELOW** Although the route-proving flights to Chitral were undertaken by the DC-3, the latter had been replaced by the Fokker F-27 on the route by July 1962. "Airbus" services in East Pakistan (now Bangladesh) continued to use the DC-3, however.







**ABOVE** Approaching the Lawarai Pass as seen from the cockpit of the DC-3. A minimum altitude of 12,500ft (3,800m) had to be reached before a crossing of the pass could be attempted. The crews always used oxygen for this part of the journey, although this was not necessary when the pressurised F-27 took over flying the route.



**ABOVE** John's photograph taken from the cabin while the DC-3 threaded its way through the 12,100ft (3,690m)-high Lawarai Pass shows how little margin for error there was during this crucial part of the flight. It was strictly enforced that the route, which took less than an hour to complete, could be flown only in fine weather conditions.



**ABOVE** Chitralis greet the DC-3 after its landing at the remote valley airstrip. To provide perspective, the terrain in the background was virtually the same on the facing side of the valley. **OPPOSITE PAGE.** A magnificent photograph of the majestic Hindu Kush taken as the DC-3 headed into the Chitral Valley from the Lawarai Pass.

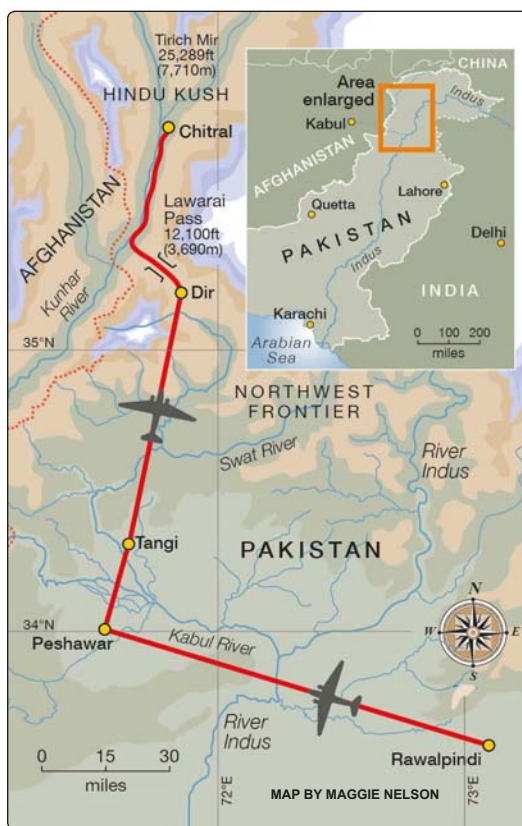
American for the weekly service to London, adding to the jet fleet the following year with purchases of the more cost-effective 720.

An important aspect of PIA's operations was the continuation of the domestic routes to the more far-flung parts of the new Dominion, with Fokker F-27s operating in both East and West Pakistan, and the venerable C-47s maintaining "airbus" services to primitive strips high up in the upper reaches of the Indus River close to the border with Afghanistan.

### THROUGH THE MOUNTAINS

In 1962 John Stroud was exploring the Indian subcontinent as part of one of his many regular continent-crunching info-gathering expeditions. Thus it was that he found himself in the right place at the right time to fly on the first route-proving flight on PIA's new Rawalpindi—Chitral route that February.

Located in Pakistan's northern Punjab region, Rawalpindi was a growing city at the time, serving as the nation's capital while Islamabad, ten miles (13km) to the north, was being built, work on the latter having started in 1959. The new service was to be a literal interpretation of the much-used "airbus" metaphor; the accommodation aboard was extremely spartan, to the extent that passengers were encouraged to bring their own bedding. There was nothing so advanced as a reservation system — travellers turned up at the









“bus-stops” and took pot-luck that space was available. It was, however, cheap — in some cases cheaper than the already-competitive rail fares.

The airline had a vast amount of experience of mountain and valley flying, having established routes up the Indus to Gilgit and Skardu. In his piece for *Flight* in the March 22, 1962, issue, John explained: “The mountains are higher and the valleys narrower on that run than on the Chitral flight, but whereas there are many ways of getting into the Indus Valley there is only one way in and out of the Chitral Valley, and that is over the 12,000ft Lawarai Pass”.

Starting at Rawalpindi, the new service saw the DC-3 initially head for Peshawar, 90 miles (145km) to the north-east, where a shallow turn to starboard pointed the DC-3 towards Tangi, 25 miles (40km) north-east of Peshawar.

“The route has no aids and the pilots’ notes

state that ‘any deviation from VFR [visual flight rules] shall endanger the safety of the aircraft’”, John explained. “Anyone who has flown over, or rather through, the terrain needs no warning that he must remain VFR.” He continued:

“The distance from Peshawar to Chitral is only 115 miles [185km] by air but the surface journey takes some two days and is described locally as ‘very frightening’.”

From Tangi another turn to starboard put the DC-3 on a northerly course to Dir, the passengers getting a magnificent view of a nameless 10,690ft (3,260m) peak from the starboard windows. What John describes as “a little 7,579ft [2,310m] hump” was used as a checkpoint. Dir marked the beginning of the Lawarai Pass, at which point the flying became more spectacular — and more challenging. To get through the 12,100ft-high pass, it was mandatory for the crew to use



*The 20th Century meets the Middle Ages — the DC-3 is inspected by the local population at Chitral. Reportedly, the aircraft's registration had been changed from AP-AEI to AP-AJT as the "I" in the former would have meant referring to it with the phonetic-alphabet word "India", which the Pakistani authorities deemed unacceptable, relations between the two nations being very poor. The DC-3 ultimately went to Air Taxi of Iran as EP-AGZ in 1968 but was written off in a non-fatal take-off accident at Ahwaz in southern Iran in April 1970.*




oxygen, the DC-3 threading the needle through the gap at 12,500ft (3,800m). With the pass behind him, John described the final leg of the journey:

"After crossing the pass the aircraft is flown down the valley, keeping above the Kunhar river to avoid turbulence. The Chitral runway is 6,000ft [1,800m] long, at an elevation of nearly 5,000ft [1,500m], and landings have to be made from the south and take-offs towards the south".

The reason that both take-offs and landings had to be made to the south was that the northern end of the runway was blocked by the towering Tirich Mir, the highest mountain outside the Himalayas at 25,289ft (7,710m). John pointed out, however, that on one occasion a DC-3 had taken off to the north, thankfully with benign results, "but those up front remarked that 'the mountains came up rather fast'". It was not done again.

On landing at Chitral a crowd of 250–300

Chitralis surrounded the aircraft, the first time that many of them had encountered any modern technology. After a few hours the trusty DC-3 was prepared for the return flight to Rawalpindi, having proved that the route was viable, if challenging, and only possible in the most clement of conditions. Naturally, John made the most of the opportunity to photograph one of the most remote airstrips in the world, and several of his magnificent images are seen here for the first time. It had certainly been a trip to remember. The last word should go to *Flight's* intrepid reporter, who signed off by saying that "the route is impressive to say the least, and it can all be enjoyed for the equivalent of about £7 return..." **NS** 

**ACKNOWLEDGMENTS** The Editor would like to thank Colin Higgs and Jo Ware at A Flying History Ltd ([www.flyinghistory.com](http://www.flyinghistory.com)) for their help with this feature



# FROM SWORDFISH TO FIREFLY

PHOTOGRAPH VIA AUTHOR

## *The distinguished aviation career of* **DUNCAN MENZIES / part two**

In the concluding half of his article on the long and illustrious flying career of test pilot Duncan Menzies, **MATTHEW WILLIS** examines the Scotsman's three decades with Fairey Aviation, during which he established a reputation as one of Britain's finest airmen. We take up the story as the 29-year-old Menzies leaves the RAF to join his new employer

**A**FTER SEVEN YEARS with the RAF in the Middle East and at home, and having received an invitation to join the Fairey Aviation Co, Flt Lt Duncan Menzies was transferred to the reserve of RAF officers on August 24, 1935. Two days later, he joined Fairey as deputy chief test pilot.

Although Menzies had been hired as a second string to Chris Staniland, Fairey was then expanding its operations, having purchased the old Crossley engine factory at Heaton Chapel, near Stockport, now part of Greater Manchester. Menzies would become the lead test pilot for aircraft produced at this site.

Duncan's arrival was particularly timely for



Fairey, which would soon need an experienced test pilot to assess and approve the production examples of its Hendon heavy bomber. This was the first aircraft to be produced in volume by Fairey at the Heaton Chapel site, and represented a significant advance in the modernity of heavy bombers in the RAF at the time, although newer designs were already on the way.

It would be some time before the production Hendons were ready, however. Menzies therefore spent the first year of his employment at Fairey flying mostly from the company's Great West Aerodrome at Harmondsworth in Middlesex (now subsumed into Heathrow Airport). This period mainly

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**TOP** One of the superb photographs taken by Beken of Cowes of Swordfish K5662 during trials from Southampton Water — possibly with Menzies at the controls, as he was photographed flying it from the tidal estuary in March 1936. He had also flown it with a wheeled undercarriage from the Great West Aerodrome the previous month.



*Duncan Menzies at the peak of his career as a test pilot for Fairey Aviation. The distinguished Scottish airman's early days with the RAF were covered in From Farmer to Test Pilot, the first half of the author's biography of Menzies, the first to be based exclusively on the pilot's own logbooks and documents, in TAH11.*

MENZIES FAMILY ARCHIVE VIA AUTHOR





**ABOVE** When Menzies first joined Fairey he was put to work test-flying Swordfish for the company's southern operation, flying the type regularly from the Great West Aerodrome near London during the first half of 1936. This Swordfish Mk I, K8871, operated with the RAF's Torpedo Training Unit before joining the Royal Navy in 1941.

involved production and development test flying for the Swordfish, checking handling, control and performance. Some of this work involved floatplane variants, which were usually tested on Southampton Water. Several of these sessions were fortunately recorded by the famous marine photography company Beken of Cowes. Beken captured test flights in which Duncan assessed the aircraft at torpedo load, and with experimental servos on its water rudders (the Swordfish floatplane, as originally delivered, did not meet the Fleet Air Arm's requirements for its turning circle on the water).

A large number of Swordfish were being delivered to the Fleet Air Arm at this time, and Menzies was kept busy with acceptance flights before they were handed over to the customer. He also found time to get married, wedding Mary Margaret Scott Paterson — whom he always called "Scott" or "Scottie" — at Invergordon in April 1936.

After a long delay the production of Hendon bombers got under way at Heaton Chapel, and

in May 1936 Duncan was informed that in the autumn he would be required to start test-flying the aircraft.

### **STRINGBAG TO HENDON**

"I was given four months' notice by Major Barlow, our General Manager at Stockport [Heaton Chapel], who said, 'I will need you on September 1, 1936'..." Menzies recalled during an interview with Manchester-Ringway archivist Michael Hancock in 1988. "Four months is a very long time. In fact I flew the first Hendon from Barton [Fairey had taken over the First World War aircraft factory on the airfield in 1934] on September 2, one day after the estimated date put down for the first flight, which was rather interesting I thought.

"We [built and] flew 14 Hendons from Barton. The Hendon was a large aircraft, with a wingspan of more than 100ft [30.5m], and to get it into the main hangar at Barton it had to be put on skates and put in sideways."

The Hendon had taken a great deal of time to

**Fairey's only foray into heavy bomber design, the Rolls-Royce Kestrel-engined Hendon was the first such cantilever monoplane to be built in Britain. The first production Hendon, K5085, seen here, was test-flown by Menzies in September 1936.**

TAH ARCHIVE







**ABOVE** The Hendon prototype, K1695, in its usual nose-down attitude during a photographic sortie with Fairey's chief test pilot Chris Staniland at the controls. The type entered RAF service with No 38 Sqn at Mildenhall in November 1936, the Service's 14 Hendons operating until late 1938, when they were replaced by Wellingtons.

reach production, partly as a result of its extreme modernity at the time of its initiation and partly as a result of Air Ministry vacillation. Indeed, the Air Ministry Specification to which the Hendon had been designed — B.19/27 — had been issued before Menzies had joined the RAF, and its development had taken longer than his entire commission! Even with such an extensive development, the Hendon was still not entirely right by the time the first production machines were completed in late 1936. Menzies was required to test the entire production run for lateral trim, and tail buffeting remained a problem.

Nevertheless it was clear that the unrelenting and stressful business of production and test flying had not in any way dampened Menzies' enthusiasm for flying. In November 1936 he wrote to his wife following a Hendon test flight, enthusing that "I had a grand trip today. There was miles and miles of fog but I was up above it in the most perfect weather and it was a fine day at this end".

Preparation for test-flying the large modern monoplane bomber was minimal. Before Menzies flew the first production aircraft — K5085 — on September 2, 1936, his sole acquaintance with the type had been a 60min flight in the prototype back in February. Furthermore, the tests all took place from the small grass aerodrome at Barton, despite the large bomber needing "plenty of space", in the assessment of the RAF pilots of No 10 Sqn.

At a time when both society in general and the armed forces were still stratified according to

class, Menzies was perhaps unusual in having a natural ability to win the loyalty of enlisted men and officers alike. One such relationship was with Frederick Kale, a flight-test engineer who shared most of Duncan's flights in the production Hendons. According to Duncan's son Peter Menzies, Kale had very great respect for his father, and named his son Colin Duncan in honour of the test pilot.

As production at Heaton Chapel — and consequently test-flying — ramped up, Menzies gained an assistant test pilot, Flt Lt Sam Moseley (**INSET LEFT**), who was to become a key part of Fairey's northern test-flying operations, especially after the outbreak of the war in 1939.



### **FIRST INTO RINGWAY**

Meanwhile the development of a more suitable flight-test centre was under way. Fairey was instrumental in the development of Ringway, which replaced Barton as Manchester's municipal airport in 1938. The company built a hangar and office buildings on the new site, on which Menzies was the first pilot to perform a landing. The milestone was recorded by Duncan in his typically understated manner:

"There was an occasion in December in which the General Manager at Stockport asked me to take a Mr Hessey, who was understood to be a member of the Corporation, over Ringway to see the site from above", Menzies recalled during his interview with Michael Hancock. "There was no question of landing at Ringway on that date, as the grass strip, about 300yd [275m] wide and



TAH ARCHIVE

**ABOVE** Although the Fairey Battle could deliver twice as many bombs twice as far as the types it replaced, the Hawker Hart and Hind biplane bombers, it was nevertheless easy prey for the new generation of monoplane fighters; a lesson learned the hard way during the early days of the Second World War.



VIA AUTHOR

**ABOVE** Menzies shakes hands with Alderman Joseph Toole, Lord Mayor of Manchester, as Richard Fairey looks on during the opening ceremony held by Fairey Aviation at Ringway on June 8, 1937. The company had just completed an assembly hangar at the airfield, where Heaton Chapel-built Battles were tested.

800–1,000yd [730–915m] long, had been sown in September and the ground was insufficiently firm; we would have gone axle-deep had we attempted to land on that date.

"Another flight which was of interest," Menzies continued, "was coming up from Heathrow with another test pilot as passenger on May 17, 1937 [in *Hornet Moth* G-ADND, used frequently as a Fairey "hack" and still flying in 2015 — Ed]. The weather when we got to Congleton was very poor. Visibility was down to 500yd and the nearest I was able to get to Barton was Sale and I couldn't even see the canal. My passenger didn't like the weather conditions and neither did I, so I returned to the grass strip which I had been watching for some months. I decided it was firm enough to land on and we landed there as a matter of convenience; it was not an emergency landing, it was very suitable."

In June 1937 Fairey began to use the airfield at Ringway, the company holding its own opening ceremony that month, as Menzies later recalled:

"On June 8 Fairey gave a garden party opening . . . at which a demonstration of the Battle was given. Alderman Toole, Lord Mayor of Manchester, was the chief guest [and] Richard Fairey, chairman and managing director of the Fairey Aviation Co, was the host."

Menzies and Staniland gave flying displays of the company's Battle at the event, the former putting K7563, the sixth production example, through its paces. The Heaton Chapel works was by that time devoted to the production of the light bomber. The Battle followed hard on the heels of the Hendon and Menzies had flown the first production example, K7558, from the Stockport factory only a week after the last Hendon had left.



*Owing its lineage to the Battle, the Fulmar two-seat naval fighter was an altogether better prospect; smaller, more agile and equipped with eight 0.303in-calibre wing-mounted machine-guns, the Fulmar acquitted itself rather better in war than its forerunner. The Mk II variant, as seen here, was fitted with a 1,300 h.p. Merlin 30 engine.*



When Ringway was formally opened the following year, on June 25, 1938, Menzies was given the honour of escorting Sir Kingsley Wood, the Secretary of State for Air, and representatives of the government around the Fairey hangar.

Much of Menzies' work now related to the Battle, an all-metal stressed-skin monoplane design that was considerably more advanced than anything Fairey had produced to date. Also in June 1937 Menzies demonstrated Battle K7561 to the Belgian Air Ministry at Evère, near Brussels. Fairey had a close connection with Belgian aviation, having set up the *Société Anonyme Belge Avions Fairey* subsidiary at Gosselies in 1931, and was hoping to sell Battles to the Belgian Air Force. Menzies had flown several of the air arm's officers in the prototype Battle in April 1936. The demonstration was evidently a success as Belgium ordered 16 Battles, to be built by Fairey at Stockport, not Gosselies. These machines had slight modifications to the RAF standard, including a longer radiator intake fairing, and were reputed to be faster than their British equivalents.

A few days after the demonstration in Belgium, Menzies had the first taste of the aircraft with which he would later be associated more than any other. Fairey was in the process of developing a smaller, aerodynamically cleaned-up version of the Battle in response to Air Ministry Specification P.4/34 for a light day bomber, and, although it was rejected in that role, it later formed the basis for the Fulmar naval fighter. Menzies flew the second prototype P.4/34, K7555, at the Great West Aerodrome on June 27, 1937, performing handling trials.

Much of 1938 and 1939 was taken up with the production testing of Battles, however, which

were by now pouring off the Heaton Chapel production line. By the end of the year more than 400 machines from the RAF contract, plus the 16 Belgian Battles, had passed through the Heaton Chapel test-pilots' hands.

### **ENTER THE FULMAR**

On the outbreak of war in September 1939 some 800 Battles had been delivered to Air Ministry contracts. Advances in aviation had been so swift, however, that what had been the most modern light bomber in the world just a few years before was now obsolescent.

Shutting down the production line at Heaton Chapel at that time was out of the question, so the Battle continued to be built until other types could replace it. An increasing number of the machines tested by Menzies and his assistants were trainers and target-tugs. Thereafter many Battles were returned to Heaton Chapel to be reconditioned and converted for second-line duties. Before the outbreak of war, however, preparations had begun at Heaton Chapel for production of the Fulmar. The second P.4/34 prototype, K7555, was flown to Ringway by Menzies in August, having been modified with clipped wings, better to replicate the handling of the production Fulmar; the aircraft was recorded in Duncan's logbook as the "P.4/34 Fulmar".

In January 1940 the first production Fulmar, N1854, was completed. Menzies took it up for its first flight on January 4. "On the first flight we had rudder instability, and this was cured by an increase in the mass-balance on the rudder, forward of the hinge-point", Menzies recalled in his interview with Michael Hancock. By January 16 the new rudder had been fitted and flown.

From then on the production testing of Battles



**ABOVE** Unquestionably flawed and very unpopular with its crews (and indeed with Menzies), the Barracuda nevertheless achieved more than its many critics care to admit; it sank ships totalling some 40,000 tons in little more than ten months and heavily damaged the Tirpitz in April 1944. This Mk II, P9926, totes a torpedo complete with air-tail.

was increasingly mixed with the development programme for the Fulmar. Officially, no prototype Fulmars had been ordered, as the P.4/34 aircraft were felt to have fulfilled that role. However, N1854 was to all intents and purposes a prototype and the first few machines under the production contract were all used for the development programme — the first that Menzies had led at Fairey, and the achievements of the aircraft in Fleet Air Arm service were in no small part the result of his painstaking efforts to improve it.

Having been a Service pilot, Menzies had a keen understanding of what the ideal characteristics of a military aircraft should be, in particular that it should be easily manageable by inexperienced pilots. That the Fulmar was widely regarded as a docile and straightforward machine to fly can be attributed to Menzies' abilities as a development pilot as well as to Marcel Lobelle's design.

By late May 1940 the realities of war were all too apparent to those as closely involved in the war effort as Menzies, and that month he relocated his young family to Scotland. While visiting the southern Fairey operation Duncan caught sight of the Prime Minister's de Havilland Flamingo, escorted by eight Spitfires, as it returned from France. Churchill had been engaging in urgent shuttle-diplomacy with the French government, in a desperate attempt to shore up resistance to the German advance.

While Menzies cannot have known the precise purpose of Churchill's presence that day, it was clear that the war was not going well.

Belgium had all but fallen and Menzies was naturally concerned about the staff at Avions Fairey. "All of our people got out of Gosselies in Belgium all right and are scattered around France at the moment", he wrote to his wife on May 23, 1940, adding that one of the engineers had moved his family to Britain on the outbreak of war, only to move them back just before the German invasion!

The precariousness of the situation is further indicated by a suggestion Menzies had heard that test pilots might even be required to throw their weight into the balance.

Having been an RAF pilot, Menzies does not appear to have been resistant to the idea. "[Fairey test pilot Foster H. 'Freddy' Dixon was told yesterday that test pilots might be called up anytime", Menzies revealed in the letter to Scottie. "Having got you and the children parked now I don't think I would grumble much, especially if they gave me a Spitfire or Hurricane to go after them in."

In the event test pilots were not required for front-line service, which was fortunate for the war effort. Menzies even gained another assistant, in the shape of Albert Eyskens (**INSET, ABOVE LEFT**), a former test pilot with Avions Fairey who had escaped to Britain when Belgium fell. This was just as well, as the work of Fairey's northern operation was ever-increasing.







TAH ARCHIVE

**ABOVE** A shimmering Charles E. Brown colour photograph of the prototype Firefly Trainer — the basis of the Firefly T.1 and T.2 dual-control training aircraft — in its initial B Conditions marking “F1”, which Menzies took on its maiden flight in July 1946. Subsequently registered G-AHYA for demonstrations, it became MB750 in early 1947.

As well as Fulmar development and the testing of reconditioned Battles, Fairey managed the Burtonwood repair depot and occasional test flights were required on repaired and reassembled American aircraft.

### **BREAK-UPS AND BARRACUDAS**

Menzies had suffered his fair share of scrapes in the course of his long flying career, but the most dangerous involved a terminal-velocity dive in Fulmar N4043 on February 2, 1941. It was nearly terminal in more ways than one. In his 1988 interview with Michael Hancock, Duncan explained the circumstances of the flight:

“We had a 20°-range Rotol propeller for the first year, and in production this was given an increase in pitch, which at high speeds in the dive altered the airflow over the tail, which reintroduced rudder instability. I was doing a dive on a Sunday afternoon . . . and the elevators joined in with what is known as flutter. It was a very steep terminal-velocity dive and it was quite beyond my strength to control the elevators or the rudder. The tail broke off from the fuselage leaving no controls at the back of the aircraft at all. The back end came up quickly and the speed at that time was 410 m.p.h. [660km/h]. With the tail coming up the wings were swept backwards, the engine went out of its mounting and I went through the Sutton harness, the breaking strain of which was supposed to be something in excess of a ton.”

Miraculously, Menzies’ parachute opened. He later had no memory of leaving the aircraft or his descent. The incident created an even closer

bond with Charlie Thomas, the man who packed Menzies’ parachutes for him. Duncan presented Thomas with a silver tankard in appreciation of his efforts, and every year, on the anniversary of the terminal-dive incident, the two men would meet for a drink.

Menzies was flying again by May 11, three months after the accident. Flight testing of the Fulmar, now upgraded to Mk II status with a more powerful Rolls-Royce Merlin 30 engine and the addition of a tropical filter, continued. These were joined from 1941 on the Heaton Chapel production line by licence-built Bristol Beaufighters and Handley Page Halifaxes from August 1942, each of which had to be test-flown before delivery to the customer.

By the end of 1941 a new Fairey type had also been earmarked for production at Heaton Chapel. This was the Barracuda torpedo/divebomber, which began series production in the spring of 1942. Once again, Menzies and his team were heavily involved in developing the aircraft for service with the Fleet Air Arm.

The Barracuda had a troubled birth, and despite being extremely effective in service, had a number of flaws that had to be laboriously worked out. During the production aircraft’s development Menzies made himself distinctly unpopular with the Fairey board of directors by insisting that the Barracuda was not ready and was unsafe for young pilots. Sadly, the aircraft was rushed into service and a series of crashes claimed the lives of a number of crews while working-up before handling and construction problems could be fully addressed. Menzies’

logbook reveals that a great deal of time was spent with the first two production Mk I Barracudas, P9642 and P9643, during April–July 1942, working on the aircraft's controls.

As the war progressed Menzies' took on the additional role of Fairey's liaison to the Fleet Air Arm. The aircraft he chose as his "hack" was, appropriately enough, the first Fulmar, N1854. This machine became known simply as "Duncan's aircraft" and remained his "property" after the war when it was painted in a striking blue-and-silver colour scheme and given the civil registration G-AIBE. In addition he continued test-flying all the production types produced at Heaton Chapel until the war's end.

### THE ROAD TO RETIREMENT

Following the end of hostilities there is little evidence of any relaxing in Menzies' workload. He continued working on the Barracuda, mainly the Mk V variant, which finally promised to overcome the aircraft's shortcomings; it was too little, too late, however, and the Mk V did not see action. Menzies also championed the conversion of the Firefly two-seat fighter into an advanced trainer for naval aviators. This was pursued by Fairey as a private venture to help Royal Navy pilots convert to high-performance deck-landing types. Some 34 Firefly T.1 and 57 T.2 variants were produced, all converted from former fighters, for the Fleet Air Arm and the Dutch Navy. The project was typical of Menzies, whose thoughts were never far from the need to make inexperienced pilots' lives easier and safer.

According to Peter Menzies, Duncan "always had a plan; and a plan B and a plan C". He took care to pass on his keen interest in technical matters to his younger son by rebuilding an MG sports car with him, although, interestingly, he discouraged Peter from becoming a pilot. To Duncan, flying was no longer the relatively carefree business it had been when he had joined the RAF in the 1920s.

M.C.A. Form 604

I. UNITED KINGDOM

II. PRIVATE PILOT'S LICENCE (FLYING MACHINES)

III. Number of Licence **8220**

Particulars of holder:

IV. Full name: **Duncan MENZIES**

V. Address: **White Beams, Thurlock Row, Waltham St. Lawrence, Berks.**

VI. Nationality: **British**

VII. Signature: *[Signature]*

VIII. Issued in accordance with the provisions of the Air Navigation Acts 1920 to 1947 and the Orders in Council in force thereunder, and with Annex 1 of the International Convention on Civil Aviation signed on 7th December 1944.

IX. The holder of this licence is hereby authorized to fly as pilot of flying machines in accordance with the terms and conditions specified herein, provided he also holds a current Certificate of Validity (M.C.A. Form 629A) in respect of this licence.

X. Signature of Issuing Officer: *[Signature]*

Date and stamp: **6th December, 1949**

XI. BY AUTHORITY OF THE MINISTER OF CIVIL AVIATION.

Menzies' last flight as pilot took place in August 1952 in his beloved Fulmar N1854/G-AIBE, although he continued to work for Fairey, overseeing the company's service and liaison commitments before finally retiring in 1964 after nearly three decades of unbroken service to the company. Menzies then moved to Scotland, where he died on May 10, 1997, at the age of 91.

**ACKNOWLEDGMENTS** The author would like to thank Mary Ann Bennett, Peter Menzies, David Weston, Duncan Simpson and Manchester Airport archivist Michael Hancock for their invaluable help with this series

**TOP RIGHT** Menzies' Private Pilot's Licence, dated December 6, 1949, courtesy of the Menzies family. **BELOW** "Duncan's Fulmar", G-AIBE, the first production aircraft (originally N1854), which still survives and is currently on display at the Fleet Air Arm Museum at Yeovilton (for details visit [www.fleetairarm.com](http://www.fleetairarm.com)).

TAH ARCHIVE







## AIR-BRITAIN SUMMER 2015 RELEASES

### **FALSE DAWN The Beagle Aircraft Story**

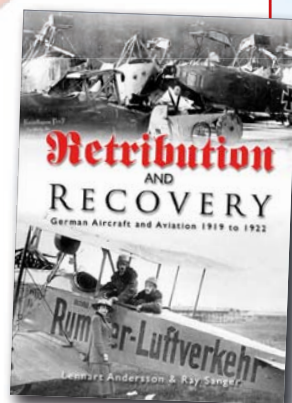
**By Tom Wenham; ISBN 978-0-85130-479-3.  
Members £39.95 Non-Members £59.95**

The long-desired definitive history of Beagle Aircraft, this 464-page A4 hardback chronicles the rise and fall of the company that it was hoped would rescue Britain's light aircraft industry, but which lasted only ten years. It was to be a decade of mismanagement, ill-advised decisions and fearsome boardroom battles. The author was allowed unrestricted access to company papers and extensive files

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*Rumble in the jungle — an RAAF DHC-4 Caribou prepares to take off from the remote Kokoda airstrip in the Oro Province of Papua New Guinea. The rugged and dependable Caribou served with the RAAF for more than four decades.*

COMMONWEALTH OF AUSTRALIA



## THEIR WORK IS DONE!

**JUANITA FRANZI** continues her series, in which she takes a detailed look at some lesser-known airframes and their markings, with a pair of RAAF Caribou in Papua New Guinea

**T**HE GRANTING OF independence for Papua New Guinea (PNG) in September 1975 signalled the end of the small Royal Australian Air Force (RAAF) de Havilland Canada DHC-4 Caribou detachment at Port Moresby. It also provided an opportunity for some unofficial nose art. For more than a decade the unit assisted with Australia's programme to develop the country's civil infrastructure in readiness for independence. For the personnel of No 38 Sqn's Detachment A (Det A), the tropical conditions and rugged terrain of PNG was a dramatic contrast to their Australian experience.

The Caribou, although underpowered for highland operations, had an invaluable combination of STOL performance and impressive capacity. It enabled cargo such as prefabricated school rooms and vehicles to be delivered into PNG's isolated islands and small highland airfields.

Some freight loads were somewhat unorthodox. An airframe engineer recalls assisting the crew on a 1975 flight to deliver coconuts to islands suffering food shortages. The cargo could not be tied down so the load was simply piled into the aircraft. A similar situation occurred in 1972 when *kau-kau* (sweet potato) runners were needed to replace highland crops destroyed by frost. The tangled roots were stuffed into the cargo compartment until it was packed to the roof.

With the large Wahgi Valley sitting at 5,500ft (1,700m) above sea level in the island's interior, surrounded by 15,000ft (4,600m) mountain ranges prone to afternoon cloud and changeable weather, the pilots needed to maintain constant awareness. Flying into cloud was suicidal and the valleys

were sometimes too narrow to complete a turn. The pre-planned engine-out escape routes had to be kept in mind as the Caribou could not climb on one engine and the jungle terrain offered few emergency landing options.

The groundcrew's life was also challenging. Propeller changes, engine repairs and other line maintenance was performed in the open on Marsden perforated steel matting and was often interrupted by afternoon storms. These conditions and the small size of the teams meant everybody worked together to get jobs done regardless of rank, and morale was high. The detachment usually consisted of two aircraft and around 20 personnel, including two flying crews. During the 1969 influenza outbreak, the detachment temporarily grew to six aircraft. Individuals were usually on two-month postings and the aircraft were rotated back to Australia every two to three months. Socialising with visiting RAAF crews occurred at the Det A bar with the help of the popular local "SP" brand beer.

Among the final Det A team was a cartoonist tasked with applying nose art for the upcoming disbandment. The design included the cockatoo from Ken Maynard's popular *Ettamogah Pub* cartoon strip and references to SP beer. A suitable phrase signifying the occasion was chosen and written on the nose in local Pidgin English.

During its time in PNG, Det A flew more than 26,500hr and suffered three write-offs, one of which was fatal. Although Det A's role was taken over by the PNG Defence Force, the Caribou of No 38 Sqn continued to undertake training and humanitarian missions in PNG.





# DE HAVILLAND CANADA DHC-4 CARIBOU, DETACHMENT A, NO 38 SQN RAAF, 1975

Juanita Ercasi 2015  
© AERO ILLUSTRATIONS

Sister aircraft DHC-4 Caribou A4-228 and A4-231, from the second Royal Australian Air Force (RAAF) order, were ferried to Australia from Canada via the Pacific, arriving at RAAF Base Richmond, New South Wales, on June 26, 1965. Caribou A4-228 served with No 38 Sqn RAAF except for a period with No 35 Sqn in the mid-1990s. During its service career A4-228 assisted flood-relief operations in Australia in 1967 and 1974, undertook absolute ceiling single-engine performance trials in June 1973, performed mapping duties in West Iran (West New Guinea) in 1976 and was damaged during STOL training in April 1993. It went on to be flown by the winning team during the joint RAAF/RNZAF Operation Exercise Shorthaul in 1999 and in March 2007 became the first RAAF Caribou to exceed 20,000 flying hours. After 44 years of RAAF service, A4-228 was finally retired on May 13, 2009.

Temporary markings were applied to Caribou A4-228 and A4-231 on the conclusion of Detachment A in 1975. The local Pidgin English inscription on A4-228 read "DISPELA IGO PINIS OLSEMI!", meaning "This fella is finished and he's also going!". The PNG flag was applied on the starboard side, as seen above.

Both aircraft were finished in standard RAAF camouflage — gloss Dark Green overall — with the No 38 Sqn fin flash. The unit's motto is "Equal to the Task".

➤ Caribou A4-231 served with No 38 Sqn and after its tenure in PNG was used during flood-relief operations in Australia in 1990. It was withdrawn from service on June 23, 2009.

The inscription on A4-231 at the conclusion of Detachment A's work in PNG was "BALUS EMI GO PINIS!" — "These birds are going because their work is done!"

## DETACHMENT A, NO 38 SQN RAAF KEY DATES

- Detachment A established on October 18, 1965, at Port Moresby, PNG
- PNG granted independence on September 16, 1975
- Detachment A concluded on December 21, 1975
- Officially disbanded at RAAF Richmond on January 17, 1976



Crew names and  
SP brewery flag



Although a full-size airframe was never completed by Lockheed, the CL-400-10, codenamed Suntan, was clearly based on Clarence "Kelly" Johnson's F-104 Starfighter design for the same company. The hydrogen-powered Mach 2.5-capable CL-400-10 was more than three times the length of its stablemate, however, and was to be fitted with specially-designed Pratt & Whitney Model 304 engines. Illustration by IAN BOTT and NEIL FRASER © 2015







# LOCKHEED'S FADING SUNTAN

## America's Unbuilt Spyplanes — Part Two: Kelly Johnson's ambitious CL-400 project

In the second part of his exclusive series on America's series of unbuilt Cold War spyplanes **Dr DAVID BAKER** tells the full story of the missing link between Kelly Johnson's innovative U-2 and the game-changing SR-71 Blackbird — the hydrogen-powered high-altitude Mach 2.5-capable CL-400 *Suntan*, a classic victim of vaulting ambition and wildly spiralling costs

**E**ARLY IN JANUARY 1956 Clarence "Kelly" Johnson, Lockheed's chief design engineer (**RIGHT**), turned up at the Pentagon with an extraordinary design proposal, one which he hoped would give the USAF a radical new way of obtaining strategic intelligence information. Johnson was there to see Richard E. Horner and Lt-Gen Donald L. Putt, Chief of Staff for Development. Johnson proposed to build a Mach 2.5-capable hydrogen-fuelled photo-reconnaissance aircraft able to fly at an altitude of 99,400ft (30,300m) and with a range of 2,530 miles (4,070km).

It was Johnson's second attempt to get the USAF interested in a dedicated spyplane. Only 18 months earlier he had proposed his high-flying sub-orbital CL-282. It had been rejected by the military but grabbed by the CIA. Under the codename *Aquatone* it would enter service in the first half of 1956 as the U-2. Designated CL-325, Johnson's supersonic hydrogen-fuelled reconnaissance concept was altogether different and within a completely new operational envelope.

The first iteration — the CL-325-1 — had a thin wing with a span of 80ft (24.35m) and a slender fuselage with a length of 153ft (46.7m). With a gross take-off weight of 45,712lb (20,731kg) carrying 14,450lb (6,553kg) of liquid hydrogen in a single fuel tank, it would be powered by two REX-III engines, each with a thrust of 4,500lb and cruise at Mach 2.25. The CL-325-2 differed in



having two jettisonable wing-mounted auxiliary fuel tanks, which would reduce both the size and weight of the aircraft by 15 per cent.

### A NEW DIRECTION

It was second time around for Johnson, who was determined to get the USAF to adopt his revolutionary new spyplane. His attention to hydrogen as a propellant had been directed by airframe studies on an unusual subsonic hydrogen-fuelled high-altitude aircraft proposed by British design engineer Randolph Rae. [See the first part of this series, Plan H: America's Unbuilt Spyplanes Pt 1 in TAH8 — Ed.] That project stalled in late 1955 when, unbeknown to the quiet Englishman, the USAF had already made up its mind to probe further into hydrogen propulsion, but in a slightly different direction.

On October 21, 1955, the Fuel & Propulsion Panel of the USAF Scientific Advisory Board supported concerted efforts to study the advantages of hydrogen fuels, seeing no major obstacles to its use in aircraft. One decided advantage was its low mass per unit volume and the capacity for high-energy output compared to hydrocarbon fuels. Thus it was that in putting together the defence budget for fiscal year (FY) 1957, the year beginning on July 1, 1956, the USAF approved a request to increase the amount of research and development money for experiments with hydrogen propulsion from \$1m to \$4.5m.

In November 1955 Wright-Patterson Air Force



**ABOVE** Although the Lockheed U-2, based on Kelly Johnson's CL-282 project, was a leap forward in high-altitude reconnaissance technology, initially it was flying at the limits of its performance during early CIA operations. The USAF wanted something with far superior performance — enter Johnson's hydrogen-powered supersonic CL-400.

Base in Ohio issued a requirement for nine hydrogen-fuelled engine systems which would be analysed by Robert P. Carmichael, the same man who had reviewed Randolph Rae's work in May 1954. These studies were sent to nine engine manufacturers and seven airframe builders, which prompted the Garrett Corporation, closely allied with Rae's work, to sue for damages on the grounds that its proprietary rights had been violated. It got nowhere, but stimulated further talk about the new possibilities for hydrogen-powered propulsion.

Kelly Johnson was already aware of Rae's work and quickly became a convert to the possibilities of taking this and its associated technology to a totally new level. Much of the design for his U-2 had been based on the CL-246, ultimately developed into Lockheed's comparatively simple F-104 Starfighter. The CL-325 would be completely different and posit a quantum step forward in aeronautical engineering and propulsion.

### A DEDICATED SPYPLANE

Why was it so important to Johnson to push for a Mach 2.5 reconnaissance aircraft with such outstanding capabilities, especially when the USAF had already rejected the much less costly U-2? The answer to that lay in fast-changing philosophies at the Pentagon, driven by a severe bout of pragmatism in the White House and the perception of a gathering threat from Russia.

Embedded within the sagely and respectable

aura of Dwight D. Eisenhower, the presidential mantle hid a multitude of challenging conflicts within the American military. Still only a few years old, the independent USAF had an appetite for new capabilities and, during the second half of the 1950s, secured technological advances unprecedented in peacetime.

Following a period of major budget increases that had characterised the administration of his predecessor, Harry S. Truman, Eisenhower was determined to reduce expenditure, sharpen efficiency and procure a series of innovative breakthroughs that promised to achieve greater supremacy over Soviet threats.

Between 1947 and 1953 the American defence budget had increased from \$52.4m to \$442m, but under Eisenhower it would gradually reduce to stand at \$344m in the final year before the inauguration of John F. Kennedy in January 1961. In those eight years of the Eisenhower administration were forged the war-fighting tools crafted by a new generation of scientists, engineers and managers, the architects of a wizard-war on conventional and traditional ways of managing new weapons systems.

It was into this environment that Kelly Johnson had introduced the U-2 spyplane to provide a major leap forward in intelligence-gathering, tied to new high-resolution camera systems from the Hycon Corporation. Approved in 1954, the U-2 project was part of a subtle transformation in monitoring Soviet activity that underpinned the





**ABOVE LEFT** At the end of his second term as President of the USA in 1961, Dwight D. Eisenhower warned against the dangers of massive military spending, which had bloomed in the previous decade. **ABOVE RIGHT** Chief of Staff for Development Lt-Gen Donald L. Putt was a major player in the Lockheed Suntan project.

Eisenhower administration's preference for a new form of clandestine surveillance. For, along with a new era in penetration and aerial reconnaissance, came approval the same year of a highly classified spy-satellite programme, a secret project kept far from the public eye and known only to a select few as *Corona*.

Concurrent with *Corona*, but formally approved only in March 1955, was the much-publicised scientific satellite Vanguard, planned for launch during the International Geophysical Year of 1957–58. *Corona* only emerged under the public name Discoverer after the first civilian satellites had been launched, setting a public precedent for secret military satellites. Before this, under the budget-busting chaos of the Truman years, strategic surveillance had been rather more fluid, with each service using existing assets to undertake clandestine photographic "raids" within Soviet airspace, wielding World War Two cameras aboard adapted wartime aircraft.

With new rocket technology capable of throwing lightweight nuclear weapons across whole continents, there was urgency too in obtaining highly accurate maps of military and industrial targets in Russia and China. Where atomic weapons had at first been regarded as "city-busters", fit only for destroying large urban centres housing an industrial workforce, the new generation of smaller and more powerful nuclear weapons were designed for a more selective range of targets. These included marshalling

yards, ports, manufacturing plants, power stations, oil and coal production facilities and a wide range of specifically hardened military targets.

It was common knowledge that Soviet maps of Russia eliminated sensitive places altogether, or displaced them geographically to confuse the country's enemies. For a brief period after the Second World War, the best maps of Russia available to the USA and UK had been liberated from the German *Wehrmacht*, the most recent military force to occupy and produce its own highly accurate maps of that country.

Reliable maps were not only required for land and air operations but also for plotting targets for the new intercontinental ballistic missiles (ICBMs) approved in 1954, entering operational readiness by the end of the 1950s. There had never been a greater need for air intelligence and ground surveillance; and, while the CIA had the U-2, the USAF had an appetite for something much more capable.

## THE RACE FOR HEIGHT

It was these imperatives that drove the need for a dedicated high-altitude reconnaissance aircraft. That search had already begun, when Lt-Col Richard S. Leghorn had taken over the Reconnaissance Systems Branch at the Wright Air Development Center in Dayton, Ohio, in April 1951. Leghorn pushed for an aircraft capable of flying at an altitude greater than 60,000ft (18,300m), above the perceived detection



**ABOVE** In total 20 Martin RB-57Ds were built, the first making the variant's maiden flight in November 1955. Incorporating extended and wider-chord wings of 106ft (32m) span and uprated Pratt & Whitney J57 engines of 11,000lb static thrust each, the type entered service in April 1956, but served with the USAF for only five years.

range of Soviet radar defences. In the immediate post-war period Soviet Russia had tolerated unannounced intrusions, but from 1950 it became increasingly aggressive, routinely shooting down unauthorised aircraft in Soviet airspace.

Leghorn pressed for engineers from British aircraft manufacturer English Electric to pay a visit to the Glenn L. Martin Company in Cleveland, Ohio, and work with their American counterparts on developing a very-high-altitude version of the Martin B-57, the American version of the British company's Canberra. Leghorn's calculations indicated the aircraft could achieve a maximum altitude of 67,000ft (20,400m) using two Rolls-Royce Avon 109 engines and new wings. However, Leghorn had proceeded without the authority of his boss, Lt-Col Joseph J. Pellegrini, head of Air Research & Development Command (ARDC). Pellegrini took the idea, however, and adapted the modifications to fit an operational version of the B-57, creating the RB-57D.

By stipulating that the RB-57D must satisfy military requirements — so that the aircraft could adopt a standard operational function in times of war rather than be exclusively a super-refined, dedicated photo-reconnaissance asset applicable only to this one role — Pellegrini limited the capabilities of the type. Good as it was, the RB-57D still left a gap for a USAF reconnaissance type of such outstanding performance that it would fly above the maximum capability of Soviet radar.

In reality Western intelligence had seriously underestimated just how far Soviet Russia had

come technologically, the latter having already overtaken the USA in radar defence systems by the early 1950s. That the Americans had fallen behind the Russians was not immediately apparent, but, in underestimating the technical and scientific capabilities of their potential adversary, they had seriously misjudged the operational requirements of a survivable high-altitude reconnaissance aircraft.

In effect, it was a race for height, with the Russians seeking to search out and destroy high-flying aircraft, and the Americans trying to outfly their adversary's air-defence systems. This was a situation only realised fully when Francis Gary Powers was shot down over Russia in a U-2 on May 1, 1960. Just six years earlier the search for a very-high-altitude spyplane had been driven by the need to map the Soviet Union accurately as well as monitor technical, industrial and operational developments across a broad front.

## THE HYDROGEN AIRCRAFT

When Kelly Johnson gave his proposal for a Mach 2.5 spyplane to the Pentagon in January 1956, he saw not only a commercial opportunity for his company, but also a new and completely unprecedented means of blending the revitalised hunger for strategic intelligence with the new mood in the White House. With missile programmes and a new conventional Mach 2.2 bomber — the Convair B-58 Hustler — in full-scale development, Johnson's new CL-400 was a completely different solution to the requirement





**ABOVE** *The epitome of America's bristling projection of global air power during the Cold War, Convair's delta-winged four-engined supersonic B-58 Hustler strategic bomber made its first flight in August 1960. Capable of carrying a nuclear weapon in the centreline pod, the type also saw service in the photo-recce role as the RB-58.*

for urgent photographic evidence of Russia's expanding aerospace programme.

In seeking to give the USAF what it wanted, Johnson was aware that Gen Curtis LeMay had rejected the notion of a subsonic spyplane on the basis that it would have strategic rather than tactical value. The CL-400, however, would do both jobs admirably. Unconvinced that the impending availability of satellite photography would answer all requirements — as indeed it would not — Johnson promised to have two hydrogen-fuelled aircraft built and one flying within 18 months. It was optimism tainted with reckless exuberance.

The USAF wanted time to examine the plausibility of Johnson's design and Donald Putt, Chief of Staff for Development, insisted on six months to evaluate the technology. Project officer for this work was to be Col Ralph Nunziato, an experienced photo-reconnaissance specialist and former test pilot, with Norman C. Appold in charge of research at ARDC. Appold managed the Wright-Patterson propulsion laboratory and had run tests on Rae's REX-I engine. He knew about the possibilities of hydrogen as a fuel and approached powerplant manufacturers General Electric and Pratt & Whitney to produce possible engine designs.

Pratt & Whitney (P&W) was selected to produce a working engine and received a contract for this work in April 1956. The company was so confident of success that it opted for a fixed-fee contract rather than argue for a costs-plus arrangement. In

the event P&W received \$15.3m for the first phase of the work but spent \$17.1m, losing money on the work. Lockheed was contracted to build the airframe but prudently opted to negotiate an interim contract that would be renegotiated and repriced at the end of the work. Lockheed designated the precise configuration of the design under contract as the CL-400-10.

Much other work was also needed, such as designing special tanks to hold the fuel, a task assigned to Lt-Col John D. Seaberg at the Wright Air Development Center (WADC), who was also to manage the development of the airframe and its incorporated systems. Seaberg had been assistant head of the Developments Office at Wright-Patterson and had been party to the rejection of Johnson's CL-282 proposal two years before.

Engine development was in the capable hands of Maj Alfred J. Gardner, a former combat pilot and an experienced engineer. The impressive Capt Jay R. Brill would manage the hydrogen supply and logistics side, initially working at Wright-Patterson before moving across to ARDC headquarters by the middle of the year.

## FAST TRACK

Known only to a very few, the name *Suntan* was applied to what was, in 1956, one of the most closely held secrets in the Western aerospace world, receiving a classification grading above "Top Secret". Only around 25 people were aware of the full programme spectrum and great efforts were made to maintain secrecy. Through a series

of designation and contract-number changes, tracing components and materials through to a single project became almost impossible, several different names and number sequences being used to hide the convergence of several subcontracts into the *Suntan* programme.

Speed of development and assembly was of the essence and, in order to bypass time-consuming bureaucracy, Col Lee W. Fulton was brought in to keep things moving and make the necessary approvals. As head of procurement at ARDC, Fulton was in the perfect position to make this happen, recruiting his deputy, Robert Miedel, to do the paperwork. High above both in the administrative hierarchy, Richard Horner, Assistant Secretary for Research & Development, provided a blanket bypass channel for awarding contracts and waiving the conventional and time-consuming procedures.

Johnson was attentive to the operational requirements of the CL-400-10 as well as the technical details of the aircraft's design. To be held in manageable tanks, the hydrogen would have to be transported and stored as a liquid (LH<sub>2</sub>). Liquid hydrogen boils at -253°C (-423°F) and has an improved volumetric capacity of 0.07kg/lit, as against 0.03kg/lit for high-pressure gaseous storage. Handbooks at the time asserted that LH<sub>2</sub> was a laboratory curiosity with little or no practical application. To test this, Johnson tasked one of his assistants, Ben Rich, with studying the problems of working with liquid hydrogen and the feasibility of fulfilling daily production quotas of 99,000lb (45,000kg), 297,000lb (135,000kg) and 496,100lb (225,000kg).

Rich was a thermodynamics specialist and, with the signing of a contract with the J.H. Pomeroy company on March 16, 1956, set to work on exploring the possibility of achieving any one of these three production levels. Reporting back on October 1, Pomeroy defined a complete liquefaction production plant, with natural gas used for producing gaseous hydrogen and an underground storage facility for liquid hydrogen at cryogenic temperatures. It was on a scale never before envisaged, let alone studied, for any form of fuel. The conclusion reached was that the lowest quota level specified was about the limit for daily production.

There was an urgent need to get to grips with the handling of LH<sub>2</sub> and the design criteria for the wide range of pipes, tubes, fittings and equipment needed to handle the cryogenic liquid. Johnson requisitioned an old World War Two bombproof revetment for this work. Known as "Fort Robinson", after the man who ran it during World War Two, it was used to set up a cryostat capable of producing 2.3 US gal (9lit) of liquid hydrogen per hour. For larger quantities

the National Bureau of Standards' Cryogenic Laboratory at Boulder, Colorado, could provide up to 757 US gal (2,860lit) a day.

## THE AIRFRAME

It is not difficult to look at the three-view drawings of the initial *Suntan* aircraft and see in its slender design the lines of the F-104 Starfighter. With the mid-placed wing showing a low aspect ratio of 2.5:1 (compared to 2.97:1 for the F-104) and T-tail configuration, its pedigree is evident, although with a length of 164ft 9½in (50.2m) and a span of 83ft 9in (25.5m) it was very much bigger. A retractable ventral fin provided stability at supersonic speeds. The CL-400-10 had a fuselage diameter of 10ft (3m), with a single fuselage tank capable of carrying 21,475lb (9,740kg) of LH<sub>2</sub>.

The two hydrogen-burning engines would be mounted at the wingtips, the cryogenic liquid fed by insulated delivery lines through the hot wing structure where temperatures would reach 163°C (325°F) at Mach 2.2. The engines were considered to be derivatives of existing gas-turbine engines, burning hydrogen rather than hydrocarbon fuels. The technology to do this was considered secondary to more pressing challenges such as handling the super-cold fuel and managing it within the aircraft's systems.

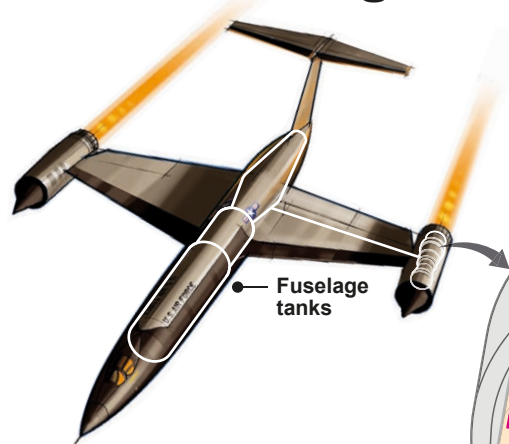
Confidence in Kelly Johnson's ability to meet these challenges was at a peak and his reputation was already legendary. Having responded to the call for an interceptor to outpace the Soviet Union's highly successful MiG-15, Johnson received a contract in early 1953 to produce what became the F-104. Powered by a licence-built version of the Armstrong Siddeley Sapphire axial-flow turbojet, it was the first combat aircraft capable of reaching Mach 2 and beyond. In 1954 Johnson secured the contract to produce the U-2. The close-knit team working on *Suntan* needed no persuading that the hydrogen-burning CL-400 could satisfy the need for a successor to the U-2.

The initial contract for Lockheed to build two prototypes was quickly followed by orders for a further four development aircraft. At inception, Lockheed worked in parallel with P&W, which regarded the project as an opportunity to develop its new J57 engine, which had emerged from the ashes of the XT45 turboprop engine initially proposed for Boeing's XB-52. As the big Boeing bomber's power requirements grew, the XT45 evolved into the J57, the USA's first homegrown 10,000lb-thrust axial-flow turbojet.

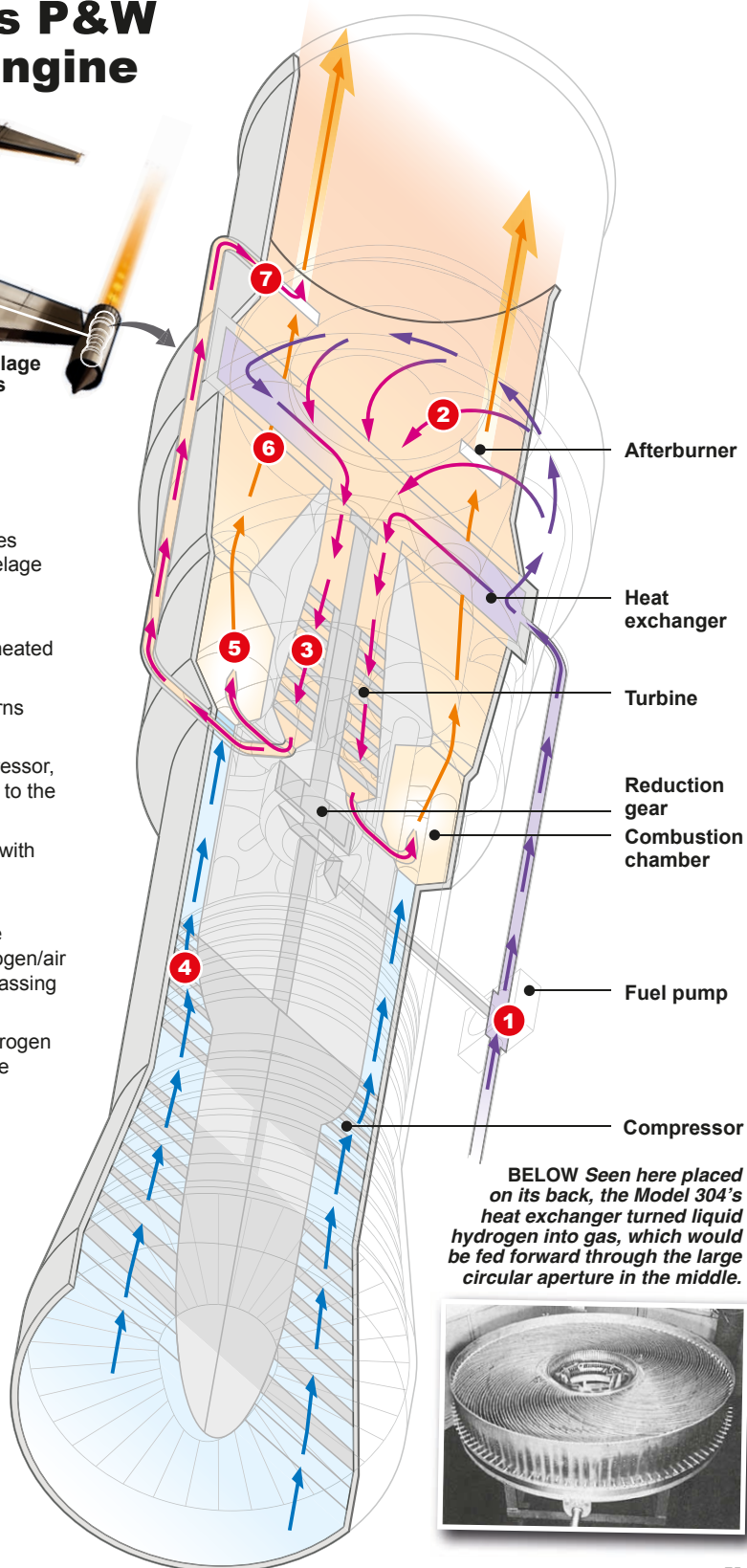
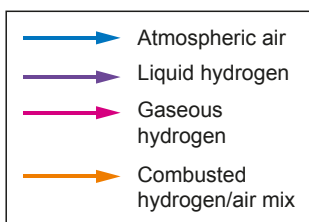
Under the codename *Shamrock*, P&W quickly adapted the J57 to burn hydrogen, the design being finalised in May 1956. With development and component testing proceeding in parallel, trials quickly confirmed the viability of the adaptation. Some changes would have to be



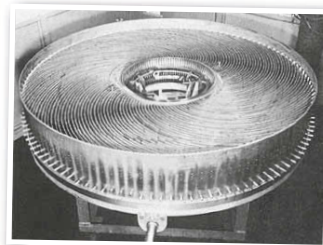
# The CL-400's P&W Model 304 engine



- 1 An engine-driven pump moves liquid hydrogen from the fuselage tanks to the heat exchanger
- 2 Passing through the heat exchanger, the hydrogen is heated to a gaseous state
- 3 The heated hydrogen gas turns the turbine
- 4 The turbine drives the compressor, which forces compressed air to the combustion chamber
- 5 The compressed air is burnt with the gaseous hydrogen in the combustion chamber
- 6 Passing out of the rear of the engine, the combusted hydrogen/air mix heats up the hydrogen passing through the heat exchanger
- 7 A portion of the gaseous hydrogen can be diverted straight to the afterburner in the exhaust to provide extra thrust



**BELOW** Seen here placed on its back, the Model 304's heat exchanger turned liquid hydrogen into gas, which would be fed forward through the large circular aperture in the middle.



Graphics: Ian Bott  
([www.ianbottillustration.com](http://www.ianbottillustration.com))  
and Neil Fraser



TAH ARCHIVE

**ABOVE** Now more than 60 years since the type's first flight in February 1954, and more than a decade after the very last examples were retired by the Italian Air Force, the F-104 still looks every inch the modern cutting-edge jet fighter. This view shows the mid-mounted trapezoidal wing and T-tail which was to be scaled up for the CL-400-10.

made, however, such as a new heat exchanger using air from the compressor to warm the hydrogen to a gaseous state, and an oil-lubricated pump for the liquid hydrogen. Another part of the programme at P&W ensured the availability of a hydrogen liquefier, with equipment installed at its plant at East Hartford in Connecticut producing 500lb (227kg) per day.

## A BESPOKE ENGINE

While the J57 ran on hydrogen as well as expected, a completely new purpose-built engine was necessary to maximise the efficiency and power of hydrogen as a fuel. Work on the detailed design of a derivative, the Model 304, began at P&W on April 16, 1956. While the adapted J57 proved that an engine could run on hydrogen, the 304, a designation extracted from a portion of the contract number, would show its full potential. By August the design was finished, based largely on the work of William Sens, a P&W engineer who had worked on the REX engines, and Wesley A. Kuhrt, a research engineer who had been playing around with hydrogen since the age of 13.

In the definitive design for the Model 304, liquid hydrogen was pumped at high pressure through a heat exchanger at the back of the engine to drive a multi-stage turbine, which in turn spun a compressor for the incoming air. A portion of the hydrogen from the turbine was directed to the airstream aft of the fan, the amount burned in this way limited by the need to restrict the temperature of the gases reaching the heat exchanger. The rest of the hydrogen was added to the afterburner behind the heat exchanger, adding to the thrust of the engine.

The development of new technology was vital to the effective operation of the Model 304. The hydrogen heat-exchanger comprised banks of 48mm stainless-steel tubing in an involute arrangement. Each of the 2,240 tube joints was furnace-brazed, about five miles (8km) of tubing being used. The rate of heating the hydrogen was enormous, going from  $-253^{\circ}\text{C}$  ( $-423^{\circ}\text{F}$ ) to  $1,226^{\circ}\text{C}$  ( $2,240^{\circ}\text{F}$ ) at a transfer rate of 72 million Btu/hr. Nothing even remotely approaching this technology had been demonstrated before.

The turbine unit had 18 stages, the largest being 17.7in (45cm) in diameter, with an operating temperature of nearly  $727^{\circ}\text{C}$  ( $1,340^{\circ}\text{F}$ ) and a power output of 12,000 h.p. The high-pressure turbine expansion section had 12 stages. Overall, the engine was pioneering many of the engineering challenges which would be faced by those who moved on to develop hydrogen/oxygen rocket motors, and the technology studied in this period was crucial to accelerating that work.

Built at East Hartford, the first engine was completed by August 18, 1957, and was ready for testing to begin at a new facility at West Palm Beach, Florida. The United Aircraft Corporation, P&W's parent company, had been building the sprawling test centre for some time, aware of the need for a new location to test big and powerful jet engines and for dispersing facilities increasingly engaged on expanding defence work. Occupying ten square miles (27km<sup>2</sup>), it was ideal for the highly classified *Suntan* engine programme.

Testing of the engine started on September 11, 1957, first with inert nitrogen to prevent damage to bearings, pumps and seals during evaluation, then with gaseous hydrogen and finally with



liquid hydrogen. The tests continued for several months, accumulating data with periodic dismantling and reassembly for scrutiny and examination. A second engine, designated 304-2, was complete by late June 1958 and joined the first in tests at West Palm Beach. The second engine had a fifth compressor stage and a lower specific fuel consumption of 0.9kg/Nhr, as against 1.1kg/Nhr on the specification of the 304-1 and an achieved 1.2kg/Nhr on tests.

Meanwhile, a duplicate of the 304-1 was built and tested in runs that accumulated more than 6hr of bench time. In late July 1958 the second engine ran away and collapsed the turbine. Repaired and with a strengthened turbine section, it was returned to the test stand in September and continued to perform well, as another hydrogen engine neared completion. By this time, however, *Suntan* was no more and the engine testing ceased, after more than 25hr of operation and indications of a highly successful solution to a demanding challenge.

## ENDGAME

Between early 1956 and mid-1958, the airframe for the CL-400 went through a series of growth spurts brought on by increasing dissatisfaction with the underwhelming performance of the paper aircraft. Within six months of starting his work on the airframe, Johnson had become acutely aware of its shortcomings. The calculated performance of the aircraft simply did not match expectations. Paradoxically, there were few technical barriers to achieving a Mach 2+ aircraft capable of flying at great altitude. Theoretically, it was possible to fly hydrogen-fuelled aircraft

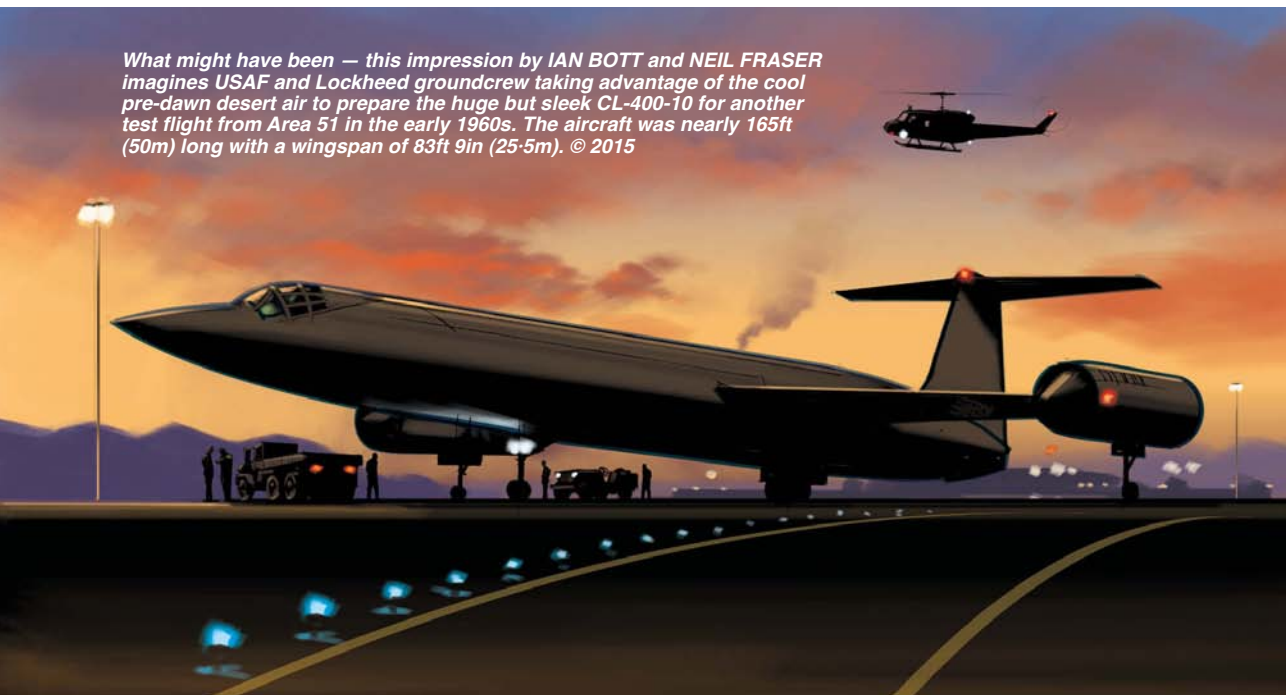
in the manner envisaged but, practically, it was essentially unworkable.

The USAF began to look hard at *Suntan* during the first half of 1956, with the only people really convinced of its possibilities being the technical teams at ARDC. Curtis LeMay, moving up to the Joint Chiefs board, remained hostile. With increasing pressure on USAF finances and a flatlining defence budget, everything had to count twice — there was simply no room for a speculative project with a single role. It is easy to underestimate the financial factor. In August 1957 Air Force Chief of Staff Gen Thomas D. White had to scale back the North American XB-70 Valkyrie programme for lack of money.

The single most critical aspect of *Suntan* was its limited range, the factor which turned Johnson against the project very soon after he started work on the airframe design. Its founding oracle, he was now its most staunch detractor. But the seeds had been sown and the technical possibilities gathered a momentum of their own. The team of engineers and scientists recruited for the *Suntan* project had fervent belief in the project, as did Seaberg, but when incoming Secretary of the Air Force James H. Douglas Jr visited Johnson in March 1957 he got short shrift. When asked about extending the extremely limited range of the aircraft he was told there was no more to be had. It was impossible to put fuel in the wings, and the fuselage already had the largest hydrogen tank possible.

This, it seemed, sealed the fate of *Suntan*. Johnson knew that he could get no more than a three per cent range extension at most and the Model 304 engine had limited potential for reduced specific fuel consumption — no more than six

*What might have been — this impression by IAN BOTT and NEIL FRASER imagines USAF and Lockheed groundcrew taking advantage of the cool pre-dawn desert air to prepare the huge but sleek CL-400-10 for another test flight from Area 51 in the early 1960s. The aircraft was nearly 165ft (50m) long with a wingspan of 83ft 9in (25.5m). © 2015*





TAH ARCHIVE

**ABOVE** The slender delta planform of the XB-70 Valkyrie, with large canards fitted to the forward fuselage, was similar to that of the CL-400-13. The unusual configuration utilised compression lift, in which the shock wave generated off the nose at supersonic speeds is used as a source of high-pressure air to generate additional lift.

per cent at most. The CL-400-10 was cancelled; the Massachusetts Institute of Technology (MIT) lost its contract for development of the inertial guidance system, although Lockheed still continued fuel test work. In October 1957 funds fell dramatically, but advocates remained optimistic that by growing the airframe the aircraft could achieve the necessary range for the reconnaissance role. Seaberg managed to get contracts awarded to North American, Convair and Boeing for a fresh look at the concept.

It was during these additional studies that the CL-400 grew in size, with comparative analysis of hydrogen- versus hydrocarbon-fuelled aircraft. It came down to the same thing; hydrogen-fuelled aircraft weighed less on take-off but had shorter range. These additional studies were handed to the USAF Air Council on June 12, 1958, at a meeting chaired by LeMay, who, while deriding the concept, allowed full and frank debate. What the group reviewed was a plethora of increasingly large and more capable aircraft, beginning with the CL-400-11 with engines mounted under the wing at mid-span, through to the CL-400-12 with four engines similarly located but in pairs.

With a length of 296ft 6in (90.4m), the CL-400-13 may be considered the ultimate *Suntan* concept. The aircraft now carried its twin engines close in to the rear underfuselage section and consisted of a slender body with swept delta wings possessing a span of 84ft (25.6m) and an area of 6,500ft<sup>2</sup> (603m<sup>2</sup>), mounted at the rear of the fuselage. With a gross take-off weight of 376,000lb (170,550kg) it was more than five times as massive as the original design and now carried a fuel load of 162,850lb (73,870kg). With foreplanes either side of the fuselage nose, it had the appearance of the Mach 3 XB-70 Valkyrie bomber, but it was more than 100ft (30m) longer and carried a bigger

wing, albeit fixed and without downwardly-deflecting tips.

With its four engines, the CL-400-14 sought a compromise between size and deliverable engine power, the original diamond-shaped low-aspect-ratio wings giving greater span for the same area. The fuel load had increased to 180,000lb (81,650kg) for a marginally reduced take-off weight. The final option, designated CL-400-15JP, reverted to convention, replacing the Model 304 hydrogen-fuelled engines with P&W J58 engines burning JP fuel under a common enclosure beneath the rear fuselage with a single intake. This option was about two-thirds the size of the CL-400-10 but with more than twice the gross take-off weight.

## SUNTAN'S LEGACY

The various options applied to the original concept had produced a range of different capabilities, with cruise speed up to Mach 4. Greater altitude was possible with hydrogen-fuelled aircraft, exceeding the height reached by conventional aircraft by up to 20,000ft (6,100m). One design from Boeing, which appeared optimum among all the possibilities, would have cruised at Mach 2.5 at a height of 100,000ft (30,000m) with a range of 2,500 miles (4,100km).

When the USAF Air Council reviewed the programme in June 1958, it had already been consigned to the scrapheap for two reasons. Although about \$100m had been spent on *Suntan*, a further \$150m was necessary for the next phase. Above that, however, was another highly classified project that Kelly Johnson had begun work on within weeks of the issuing of the CL-400 contract back in April 1956. In late 1957 U-2 project manager Richard Bissell set up an advisory committee, chaired by Polaroid co-



founder Edwin Land, to search for an optimum successor to the U-2.

Reminding the group that the U-2 would be obsolete within two years, Johnson recommended a major leap forward with a high-flying aircraft capable of Mach 3. "I want to come up with an airplane that can rule the skies for a decade or more", he said, and began designing such an aircraft. His rough draft, presented to the committee on July 23, 1958, was for the A-1, the first in a series of designs under the epithet *Archangel*, a follow-on from the first codename for the U-2, *Angel*. By mid-1959 it would mature into the A-12, precursor to the SR-71 Blackbird, and be absorbed into a major programme for the CIA under the codename *Oxcart*.

It was inevitable that with this second strand of activity under way, once again the USAF would be trounced in cutting-edge reconnaissance systems by the CIA, and there would be no purpose to the hydrogen-fuelled *Suntan*. Eventually, as with the U-2, the SR-71 would be operated by the USAF as well — not in the strategic role coveted by the CIA, but for tactical support in conventional conflicts. The work conducted on the *Suntan* programme was a good investment, however, and ultimately benefited the development of hydrogen engines in a very different sector.


On January 29, 1964, NASA launched its fifth *Saturn I* launch vehicle with a live second stage comprising six P&W RL-10 hydrogen-fuelled rocket motors. Less than five years after the issuing of the directive to produce a high-energy motor, the work on *Suntan* paid off, having greatly accelerated development of the RL-10. Had *Suntan* not stimulated a massive production effort increasing hydrogen production to 65,000lb (29,485kg) a day at liquefaction plants in Ohio, California and Florida, the *Saturn* upper stage would not have been possible — the large quantities of liquid hydrogen would not have been available when needed.

In June 1958, when *Suntan* was clearly heading for the dustbin of history, John Seaberg took the idea of hydrogen propulsion and forged a credible

base for its most potent application. The same month, the Advanced Research Projects Agency (ARPA) ordered the development of a cryogenic liquid-hydrogen/liquid-oxygen upper stage for the Atlas missile called Centaur, improving its performance so that it could launch a heavy military communications satellite called Advent. The satellite was cancelled and while Centaur became temporarily bogged down in managerial problems, Wernher von Braun's Saturn rocket team applied it to its super-booster.

The RL-10 went on to become the mainstay of the Atlas launch vehicle. Its development stimulated the J-2 engine used in both second and third stages of the *Saturn V* rocket that propelled nine Apollo spacecraft to the vicinity of the Moon. Without these high-energy propellants, the lunar mission would have required much bigger rockets with challenging technology and great cost. Engineers at Pratt & Whitney who developed the Model 304 turbojet engine burning hydrogen applied that work to the RL-10, the elegance of the jet engine forming the fundamental design thesis for the rocket motor.

The turbopump designed for the Model 304 engine was imported to the RL-10 and when rocket engineers tried to adopt the standard practice of using a separate combustion chamber to start the turbopump, Perry Pratt lifted the expander cycle technology directly from the jet and applied it to the rocket. By mid-1959 P&W had performed 230 successful tests on the RL-10 at West Palm Beach, clearing the way for it to take its place as the most important contribution to the early rocket programmes, propelling the USA far ahead of its competitors.

From the outstanding work on hydrogen-fuelled jet engines, which began with a British engineer in the early 1950s, the USA built a lead over the rest of the world. And while *Suntan*, as originally conceived, died in 1958 with all concerned getting their wings burnt, the search for a truly outstanding jet-powered reconnaissance aircraft was to lead to one of the most bizarre concepts of all time — a wonder called *Fish*. 

**Resembling a spaceship from the pages of the wildest contemporary science-fiction, the Lockheed A-12 high-speed high-altitude reconnaissance aircraft was developed from the Archangel series of designs, the first step on the road to the world-beating SR-71 Blackbird.**

TAN ARCHIVE





# **SWEDEN'S** **FORGOTTEN** **DESIGNER**

## ***Edmund Sparmann & the S 1-A***

Swedish aviation historian **JAN FORSGREN** takes a look at an obscure but attractive — if ultimately unsuccessful — monoplane trainer designed and developed in Sweden during the inter-war period, and profiles the career of the talented but reputedly rather highly-strung Austrian who created it after establishing a factory in Sweden in the 1930s

*Contemporary with Britain's Miles Hawk Major and the USA's Ryan ST two-seat low-wing monoplane trainers, the smaller single-seat Sparmann S 1-A resembled aspects of both, sharing the same Gipsy Major powerplant as the former and the overwing strut bracing of the latter.* ALL IMAGES VIA ARLANDA CIVIL AIRCRAFT COLLECTION ARCHIVE





**O**RIGINALLY DESIGNED in 1933 as a single-seat lightweight fighter trainer, the Sparmann S 1-A was produced in limited numbers for *Flygvapnet* (the Swedish Air Force), in which service it was designated P 1, operating as a liaison aeroplane and continuation trainer for Air Staff officers. The designer of this largely undistinguished, but nevertheless attractive, Swedish lightplane was Austrian expatriate Edmund Sparmann.

### AUSTRIAN BEGINNINGS

Born in Vienna on June 6, 1888, Sparmann developed a strong interest in aviation from an early age. In 1901, at the age of 14, he designed an aileron control system for heavier-than-air aeroplanes, without, he claimed, having “any knowledge of the Wright brothers”. He did not make any attempt to file a patent for the system as “it appeared all too obvious”.

Having graduated as an aeronautical engineer in 1910, Sparmann developed an early flight simulator before landing a job as director and chief test pilot for the *Österreiche-Ungärische Flugzeugfabrik* (Austro-Hungarian Aircraft Co). He also worked for aircraft manufacturer Jacob Lohner & Co in Vienna.

During the opening stages of the First World War Sparmann flew a number of operational sorties over the Russian Front. However, after being diagnosed as suffering from dysentery, he was transferred to the centre of Austria’s civil and military aviation, Aspern, as a test pilot in early 1916. Soon afterwards he became involved in design work, including the biplane wing cellule fitted to the Phönix 20.16 fighter prototype, and was later appointed chief test pilot for the Phönix company.

In 1919 Sparmann and fellow Austrian Max Perini successfully demonstrated the Phönix D III fighter and C I two-seater to the Swedish military authorities, with the result that both types were selected for use by the Swedish Army Aviation Service. Sparmann decided to stay in Sweden and was eventually granted citizenship in 1926. Briefly employed by Swedish aircraft manufacturer Enoch Thulin, Sparmann was hired in December 1921 as head of design by the small Nordiska Phoenix AB based at Malmen. The company, no relation to the better-known Austro-Hungarian Phönix company, produced only one aircraft, a small single-seat biplane powered by a 110 h.p. three-cylinder air-cooled Bristol Lucifer radial engine. The firm eventually folded in 1923.

Three years later Sparmann became test pilot with the Swedish Army Aviation Workshops (CVM), then producing both the Phönix D III



**ABOVE** *Reportedly not an easy man to get along with, Edmund Sparmann was nevertheless a gifted aircraft designer whose career was blighted by his forthright manner. Following the closure of his own factory in 1937, Sparmann reluctantly went to work for Saab for a brief period, which apparently also ended in some acrimony. Sparmann died in Stockholm in 1951.*

and C I under licence. When an indigenous Svenska Aero J 6 *Jaktfalken* fighter crashed in January 1931, killing pilot and national hero Einar Lundborg, Sparmann was appointed as a member of the accident investigation committee. When Sparmann pointed out various irregularities, he was fired, being considered “difficult to work with” by the Royal Air Board.

### THE SPARMANN FACTORY

A few years later Sparmann severely criticised the various changes applied to the Gerhard Fieseler-designed Raab-Katzenstein RK-26 *Tigerschwalbe* basic trainer built under licence by *Aktiebolaget Svenska Järnvägsverkstäderna Aeroplanavdelningen* (ASJA — for more on the company see the author’s history of the ASJA Viking in *TAH9*). The ASJA RK-26s (designated Sk 10 by *Flygvapnet*) suffered an extraordinarily heavy rate of attrition, with 18 of the 25 built being written off in crashes. Again, Sparmann’s criticism made him a distinctly less-than-popular individual among leading *Flygvapnet* officers.

During the early 1930s Sparmann won a court case regarding a breach of one of his earlier patents. In 1910 he had designed an

*The S 1-A prototype, SE-ADX, before it was destroyed in a non-fatal accident at Jönköping Airport in August 1935. A second civil-registered S 1-A, SE-AEY, was also completed and later served with Flygvapnet.*



automatic gyroscope-stabilisation device used in aeroplanes, submarines and torpedoes. The device had been patented in the USA in 1913. After the end of the First World War Sparmann's invention had been turned over to the Sperry Gyroscope Co for further development and production, hence the legal case, as a result of which Sparmann was awarded 250,000 *kronor* by the American government.

Thus Sparmann was able to establish a small factory, formally named *Sparmanns Flygverkstad* (Sparmann Aviation Workshop), during the autumn of 1932. Its first design was the Sparmann S 1-A, a low-wing single-seat monoplane powered by a 120 h.p. de Havilland Gipsy Major four-cylinder air-cooled inline engine. For its time the S 1-A was of thoroughly conventional design, the fuselage being built from steel tubing and the wings made of wood. Both fuselage and wings were fabric-covered.

#### OFFICIAL INDIFFERENCE

The first S 1-A was completed in early 1934, although it was not registered until June 25, 1935, when it became SE-ADX. Sparmann claimed that the S 1-A did not need any adjustment following the initial test flights, which took place at Barkarby. The S 1-A was subsequently demonstrated to Flygvapnet and government officials as well as in Austria.

The attractive single-seater displayed excellent performance characteristics and was offered to the Swedish Royal Air Board as an advanced fighter trainer. Sparmann's reasoning was that the type offered a comparatively cheap means by which future fighter pilots could hone their skills. (As an aside, the concept of the low-powered single-seat fighter trainer was adapted by Germany's Luftwaffe, which ordered large quantities of the Focke-Wulf Fw 56 Stösser as a

#### SPARMANN S 1-A DATA

**Powerplant** 1 x 120 h.p. de Havilland Gipsy Major four-cylinder inline air-cooled piston engine driving a fixed-pitch two-bladed wooden propeller

##### Dimensions

Span	8.0m	(26ft 3in)
Length	6.18m	(20ft 3in)
Height	2.0m	(6ft 7in)
Wing area	8.54m <sup>2</sup>	(91.9ft <sup>2</sup> )

##### Weights

Empty	425kg	(937lb)
Loaded	610kg	(1,345lb)

##### Performance

Maximum speed		
at sea level	250km/h	(155 m.p.h.)
Cruise speed	220km/h	(137 m.p.h.)
Rate of climb	2,000m in 6min	(6,600ft in 6min)
Service ceiling	5,800m	(19,000ft)
Normal range	800km	(500 miles)

lead-in trainer to more advanced fighters.)

Despite the S 1-A's successful flight demonstrations, the Air Board remained lukewarm towards the type, considering it something of a "toy". It was felt that the S 1-A offered little improvement over the trainers then in Flygvapnet service. Indeed, so little interest was shown in the S 1-A that the aeroplane was not even test-flown by Flygvapnet pilots.

The prototype did not last long, being written off in a spectacular non-fatal crash on August 25, 1935, during the inauguration of Jönköping Airport. The crash was caught by a film crew, and subsequently included in a Swedish film.

Despite the negative attitude of the military authorities, Sparmann persisted in promoting the value of the S 1-A to politicians, extolling its virtues as a military trainer and emphasising



**BJÖRN KARLSTRÖM**

Träpropeller  
(Wooden Propeller)

**MOTOR (Power plant):**

4-cyl. 130-hp  
Gipsy Major.

Plywoodklädda vingar, stabilisator, och fena. Stålrörskropp med dukklädsel. Dukkklädda höjd- och sidroder.

(Plywood covered wooden wings, stabilizer and fin. Fabric covered steel tube fuselage. Fabric covered elevator and rudder.)

Pitot

Bränslemätare (Fuel gauge)

Pitot

En del plan utrustades med kabin.

(Cabin fitted to some S.1-A's.)

#### FÄRGSHEMA:

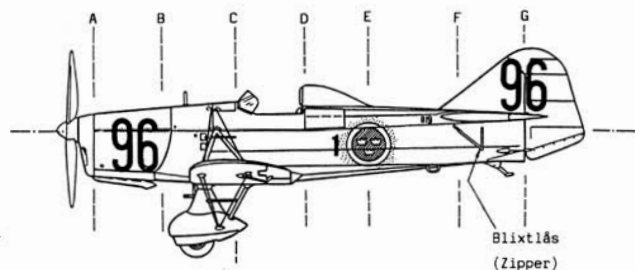
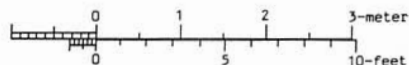
Hela planet silverdopad.  
Gula kronor med tunn svart kontur på ljusblå bottenyta med en gul ytterring. Svarta siffror.

#### COLOUR SCHEME:

All silver airframe. Yellow crowns edged in black on a light blue circular field with a yellow outer circle. Black numerals.

Inga nationalitetsmärken på vingarnas översida 1940 - 44.

(No national insignias were carried on upper sides of the wings 1940 - 44)



P 1  
SPARMANN S.1-A  
"SPARMANN-JAGAREN"

ABOVE Scale drawings of the Sparmann S 1-A by the late BJÖRN KARLSTRÖM. For the static modeller a number of S 1-A resin kits in 1/2nd scale are available, including one from Czech company Kora Models ([www.lfmodels.com](http://www.lfmodels.com)) and two versions — one open-cockpit and one enclosed — from Ardpol (for details see [www.scalemates.com](http://www.scalemates.com)).

**Sparmann P 1 c/n 818 fitted with a ski undercarriage while serving with Wing F 2 at Hägernäs. The aircraft was eventually withdrawn from use in January 1947 and scrapped.**



the possibility of reducing monetary allocations to Flygvapnet. An initial order for three examples was subsequently placed on October 4, 1935, following the intervention of the Social Democratic Defence Minister, Janne Nilsson, after the workers at Sparmann's factory pleaded to the government that if the S 1-A was not ordered by Flygvapnet, their jobs would be lost.

The S 1-A was given the Flygvapnet designation P 1, indicating the test and evaluation role (P for *Prov* — Test). The first two were delivered in June 1936, with the third being accepted the following month. These were the third, fourth and fifth S 1-As built, the second being a replacement for the destroyed SE-ADX. This second example was given the civil registration SE-AEY on June 4, 1936.

Following formal evaluation of the type at Ljungbyhed, an additional six P 1s were ordered in February 1937. A possible reason for this apparent *volte face* was that the P 1s had by this time been flown exclusively by flight instructors, who declared the type a delight to fly. The second demonstration aircraft, SE-AEY, was also acquired by Flygvapnet, in February 1938. It

would appear that the P 1 was at one point given the tentative designation Sk 13, but ultimately the type retained its P 1 test-aircraft designation.

#### **A HIGH ATTRITION RATE**

In the event, the P 1 was little used as an advanced trainer. The type was delivered from late 1937 until early 1938, and seven of the ten P 1s were distributed as follows: Air Staff Flight, Wing F 8 Barkarby (2); Wing F 1 Västerås (3); Wing F 2 Hägernäs (1) and Wing F 3 Malmö (1). The remainder — the first three P 1s — were eventually transferred to Wing F 8. Although originally intended as advanced trainers for budding fighter pilots, the P 1s were in fact used as liaison aircraft and continuation trainers for high-ranking Flygvapnet officers. One P 1 was modified with an enclosed cabin; a considerable advantage in the harsh Swedish winters.

Five P 1s were written off, with three pilots being killed. The four remaining aircraft were offered for sale in 1946, but there were no takers. Thankfully, one P 1 was set aside for preservation, and is currently on display at the Flygvapenmuseum in Malmö.

**A poor-quality but rare photograph of one of the three P 1s evaluated at Wing F 5 Ljungbyhed during the summer of 1936. Note the absence of the distinctive headrest later fitted to Service P 1s.**







*A rare air-to-air portrait of P 1 c/n 818 during its service with Wing F 2. The aircraft was never given an official name but was usually referred to as the Sparmannjagaren – “Sparmann Fighter” – despite the fact that it was unarmed except for an occasionally-fitted camera-gun.*

Although the S 1-A was the sole product of the Sparmann company, its other designs are also worthy of mention. Construction of a very light amphibian, the Sparmann S 2, commenced in 1934 but was not completed. Co-designed by Sparmann and German glider designer Walther Stender, the S 2, allocated c/n 2, was to be powered by a 15 h.p. Knöller engine. In 1938 the incomplete S 2 was sent to Saab at Trollhättan, from where it was transferred to the Trollhättan Aero Club. Some work on the amphibian was undertaken but it was never completed, being consigned to storage before being burnt in 1949.

It is not known whether the designation S 3 was used for another unbuilt project, but the next design to bear the Sparmann name was the S 4 (later redesignated E 4), an all-metal single-seat fighter to be powered by a 780 h.p. Pratt & Whitney R-1535 Twin Wasp Junior two-row air-cooled radial engine. In charge of the design team was Walther Stender. The E 4 was similar in appearance to the Blohm & Voss Ha 137, featuring an inverted-gull-wing design, enclosed canopy and fixed undercarriage.

A single example was ordered by the Air

Board on December 12, 1936, and the Flygvapnet designation P 3 was assigned. In the event, the prototype P 3 was never completed; and when the Sparmann company was taken over by Saab in mid-1937 the P 3 project was abandoned, with the contract being cancelled on October 26, 1937. The Sparmann E 4 remains one of the most enigmatic Swedish aeroplane projects of the 1930s.

The final Sparmann design was the S 5 primary trainer. Both biplane and monoplane variants of the S 5 were planned, but the design never left the drawing board. Having relinquished his company, Sparmann worked on the *Taumelscheibe* (Tumbling Disc) engine, and died in Stockholm on June 24, 1951.

During the late 1980s, work began on the building of an airworthy reproduction of the S 1-A/P 1. An Australian-built Gipsy Major was acquired and the wings for the reproduction were completed. Construction of the steel-tube fuselage was begun, but sadly the project has since stalled. The semi-completed reproduction Sparmann S 1-A remains stored in the corner of a hangar at Västerås.



### **SPARMANN S1-A PRODUCTION** *Compiled by Jan Forsgren*

C/n	Reg / s/n	Reg'd / ToC*	Cancelled / SoC**	Remarks
1	SE-ADX	25.6.35		Written off 25.8.35 at Jönköping Airport
3	SE-AEY/ P 1 s/n 820	4.6.36/ 17.2.38	1937/ 19.11.38	Written off at Avesta, 25.9.38
4	P 1 s/n 811	19.6.36	19.7.40	Written off at Barkarby, 17.6.40
5	P 1 s/n 812	19.6.36	19.12.44	SoC owing to poor state of aircraft
6	P 1 s/n 813	7.7.36	12.12.41	Written off at Barkarby, 15.8.41
7	P 1 s/n 819	23.11.37	27.1.47	Withdrawn from use
8	P 1 s/n 814	26.10.37	27.11.46	Preserved at the Flygvapenmuseum
9	P 1 s/n 816	17.12.37	29.8.45	Written off at F 1 Västerås, 12.6.45
10	P 1 s/n 817	27.12.37	23.10.42	Written off at Ålunda Farm, 28.5.42
11	P 1 s/n 815	8.2.38	27.1.47	Withdrawn from use
12	P 1 s/n 818	5.2.38	27.1.47	Withdrawn from use

\* Registered/Taken on Charge \*\* Struck off Charge

# VIS — THE ALLIES' ADRIATIC EYRIE

Using testimony from the crews who used it, B-24 specialist **BOB LIVINGSTONE** details the wartime use of the Allies' vital emergency airfield on the Yugoslavian island of Vis. The runway was terrifyingly short and the facilities virtually non-existent, but to the crew of a stricken bomber desperately in need of *terra firma* it was a sparkling jewel in the Adriatic





**B**Y THE END of October 1943 the North African aerial campaign was complete and the invasion of Italy was progressing well, allowing the commencement of a two-front air offensive against Germany. To achieve this the USAAF established the Fifteenth Air Force (15th AF) on November 1, 1943, and populated it initially with six Heavy Bomb Groups taken from the Ninth and Twelfth Air Forces. A further 15 heavy groups, originally earmarked for the Eighth Air Force, were subsequently to join the Fifteenth, making up five Bomb Wings.

The 15th AF's Boeing B-17 and Consolidated B-24 heavy bombers' tasks were strategic — destroy the enemy's air force on the ground and in the air; participate in Operation *Pointblank* (in which the Luftwaffe fighter force would be drawn up in defence of strategic targets, thus

keeping them away from the front line); support the ground war in Italy and harass German forces in the Balkans. But the priority was to halt or seriously hamper enemy petroleum production, and the most vital (and dangerous) target was the Rumanian refinery complex at Ploesti, which the groups were to visit many times between April and August 1944.

One of the transferred units was the 376th Bomb Group (BG), the *Liberandos*, assigned with the 98th BG — the *Pyramidiers* — to the 47th Bomb Wing (BW), which began the move from its Ninth AF base in Tunisia to Italy on November 17, to be based at San Pancrazio, one of 45 airfields being prepared for combat operations in southern Italy.

The 15th AF established three emergency airfields to cater for the approximate tracks the bombers were expected to fly to their assigned



*With the craggy terrain of the island as a backdrop, personnel of the RAF's No 352 (Yugoslav) Sqn line up alongside the unit's Supermarine Spitfire Mk VCs during a parade to mark the occasion of the squadron's permanent move to Vis in January 1945. Other visitors to the busy emergency airfield include a pair of Consolidated B-24s, a Boeing B-17, a Lockheed F-5 Lightning and a Martin Baltimore.*

VIA AUTHOR



**ABOVE** Consolidated B-24H serial number 41-28861, named *Burma Bound* and wearing Battle No 69, was operating with the 725th BS of the 451st BG in December 1944 when it was hit by flak and photographed leaving the Munich target area. On October 7 that year, it had struggled into Vis after being damaged by anti-aircraft fire.

targets. One of these was the island of Vis, off the Dalmatian coast of occupied Yugoslavia, which, from May 1944, offered an alternative to crash-landing in inhospitable terrain, baling out over Yugoslavia or braving the dangerous flight across the Adriatic to reach southern Italy in combat-damaged or fuel-short aircraft.

### INTO ACTION

On August 22, 1944, the 15th AF fielded a force of 612 bombers and 354 escort fighters against five oil targets, out of which 32 bombers and four fighters were lost. The 376th BG flew its mission to underground fuel storage tanks at Lobau near Vienna, losing two B-24s to a mid-air collision and one which went missing; a very low account considering that the 15th AF suffered a much higher attrition rate than the Eighth AF.

The missing aircraft, B-24J-CO serial number 44-40330, named *Hardway Ten* and bearing Battle No 92 of the 515th Bomb Squadron (BS), was commanded by Capt Charles Andrews, who recalled the mission in James W. Walker's *The Liberandos: A WWII History of the 376th Heavy*

*Bombardment Group and its Founding Units* (376th Heavy Bombardment Group Veterans Association Inc, 1994):

"On August 22, 1944, my crew was assigned to *Hardway Ten* on a mission to Vienna. It was a rough mission as far as we were concerned . . . we lost one engine over the target and another [on] the same side rolling off the target. We had been hit repeatedly. We had lost our oxygen, hydraulic system, brakes and with only two engines, we had to let down and return alone.

"We had been briefed on the use of the island of Vis for emergency only, and rather than ditch in the Adriatic we opted for landing there as we couldn't have made it back to Italy. On our approach to the very short field, the B-24 ahead of us blew a tyre on landing and was parked at the end of the runway. Then, to make matters worse, an Italian transport pulled into take-off position on the runway. I could have killed the guy, as he must have seen us on our final approach. Anyway, there was no going around and the ship was not easy to handle with the two right engines gone, but I did get it on the





**ABOVE** The distances covered by the Allied bomber force based in southern Italy were considerable, with Vienna more than 500 miles to the north and the oil fields of Rumania the same distance to the east. For an Allied bomber crew returning from a mission on a wing and a prayer, the sight of Vis's primitive airstrip was, literally, a godsend.

[3,500ft/1,100m] runway and over the transport, but with no chance of stopping except for the one application of the emergency brakes; the only way to avoid the B-24 on the far end of the runway was to veer off to the side.

"What I didn't see was an irrigation ditch deep enough to stop the left mainwheel, which, when it dropped, caught the left wingtip and then the engines, and turned us over in a complete cartwheel. The 'plane was a mess and we were all inside of it. I can still hear the sound of one engine running; it had no prop but was turning over and my first thought was 'fire'. We will always thank the good Lord for the absence of fire as we would all have been dead.

"I found out a few hours after I was pulled out that two of my crew were dead and that one man was in very serious condition with broken ribs that had punctured his lungs. A day or so later a C-47 was sent in to pick us up and some others who had landed there, but I stayed on the island with my injured crewman. He had been in a coma and I didn't want him to come out of it and not see anyone that he knew.

"He only lived a day or so after that, never regaining consciousness, so I came back on another 'plane going back to Italy and joined the rest of my crew in the hospital in Bari. We were all banged up and hurt to some extent but were soon back in action. I have thought of those three men almost every day of my life."

Those killed were John E. Cross (tail gunner), Duane Hostetler (radio operator) and Vernon D. Ferguson (nose gunner).

### THE BUILDING OF VIS

The island of Vis, now part of Croatia, is advertised these days as a mysterious tourist destination, with a history dating back to the Romans and earlier. The island covers 35 square miles (90km<sup>2</sup>) and lies in the Adriatic, 28 miles (45km) off the Croatian city of Split. Its strategic location has been understood for centuries, controlled at various times by the ancient Greeks, Romans and Byzantines and the French and British in more modern times.

The relatively short-lived amalgamation of Balkan states named Yugoslavia lasted until



**ABOVE & BELOW** The shattered remains of B-24J serial number 44-40330, Hardway Ten, lie beside the runway on Vis after its crash-landing and cartwheel on August 22, 1944. Remarkably, seven of the ten-man crew survived to return to duty. The distinctive Monastery of San Girolamo is clearly visible on the hillside in the photograph below.

April 1941, when it was invaded and occupied by Germany. The Allies left the anti-Nazi fight to the Yugoslavians, supplying them mainly by air-drops by both USAAF and RAF aircraft, despite the country being opportunistically split in a civil war between nationalists, communists (Partisans), fascists (Ustaša) and royalists (Chetniks). It was the invading Russians whose eastern pressure began the withdrawal of German forces in October 1944, but fighting continued until the end of May 1945, after the German surrender, when the leader of the Partisans, Josip Broz Tito, assumed control and all sides then surrendered to the British.

Vis was never under German rule, having been occupied (and renamed Lissa) by the Italians in 1941, but they abandoned the island after Italy signed an armistice with the Allies on September 8, 1943, after which Tito's Partisans assumed

control. The Germans poured troops into Italy but with limited naval assets were only able to capture and hold the islands close to the coast. The Royal Navy, looking for an advance base for Balkan coastal raids, and the British Army, looking for a location from which to support Tito's Partisans, realised that Vis was the only possible geographical location.

Half of the British Army's No 2 Commando unit, all that was considered necessary, arrived in January 1944, primarily to defend the island; but, led by its bagpipes-wielding commanding officer, Lt-Col J.M.T.F. "Mad Jack" Churchill, it undertook aggressive raids on mainland coastal towns. Together with a small force of US Army Rangers, two Royal Marine Commando units, some men from the Highland Infantry and a Royal Artillery detachment, the force had subdued the German units on the islands of







**ABOVE** An interesting photograph of an RAF Hawker Hurricane Mk IV, probably of No 6 Sqn (which used Vis frequently as an advanced base from May 1944), armed with an asymmetric load of 3in rocket projectiles on the port wing and a 44gal long-range fuel tank on the starboard — these were more usually fitted the other way round.

Solta and Hvar by May 1944. The Royal Navy based motor torpedo boats (MTBs), motor gun boats (MGBs), harbour-defence motor launches (HDMLs) and a few destroyers in the harbour under the command of Lt-Cdr Morgan Giles.

Helped by the British military, an airfield to support the Partisans on the mainland was built by the Yugoslavs in May 1944, and became the home of the *Escadrila zu Vezu* (Headquarters Liaison Squadron) of the Balkan Air Force on the latter's formation (of mainly RAF units) that June. Based at airfields in Italy, two RAF units — No 351 (Yugoslav) Sqn, equipped with Hawker Hurricanes, and the Spitfire-equipped No 352 (Yugoslav) Sqn — used the airfield at Vis as a forward base, the latter moving to the island permanently on January 1, 1945.

## OPERATIONS BEGIN

Once the runway at Vis was completed, the 15th AF nominated it as an emergency airfield and briefed crews on its existence accordingly. The Luftwaffe was aware of its existence almost immediately and prepared maps of it for its pilots. To support aircrew and repair damaged aircraft, the USAAF posted a small group of personnel (approximately ten men) under the command of Capt S.R. Keator, which was assisted by RAF personnel posted to support No 352 Sqn. Keator, a man of action with little time for paperwork, is reported as stating: "We don't need typewriters or filing cabinets; if I had a typewriter I'd have to type reports, and if I wrote reports, I'd have to file them. We'd rather fix airplanes".

While the runway was being built, Tito had his own problems. His headquarters at Drvar in Bosnia was attacked by the Germans during Operation *Rösselsprung* (the knight's move in

chess), an airborne and ground assault intended to capture or kill Tito. Aided by raids mounted from the island as a distraction, Tito and the Central Committee escaped to an airfield near Kupres where they were flown to Bari in a C-47 and thence moved to Vis aboard the destroyer *HMS Blackmore* on June 6. Tito left Vis for the last time on September 20 for Russia before entering liberated Belgrade on October 15, 1944.

Meanwhile, Vis continued to operate as an emergency airfield for Allied aircrews. In his comprehensive book on the Ploesti raids, *Fortress Ploesti* (Casemate, 2003), author Jay A. Stout highlights the challenges faced by desperate aircrews with only bad options to choose from:

"Many bomber crews who were hit over the target managed to make it back through enemy territory, across Yugoslavia, and to the eastern shore of the Adriatic. Ahead of them lay 100 miles [160km] or more of forbidding sea. If making it back across the Adriatic Sea to Italy was a doubtful proposition, one option available to them was an emergency landing at the island of Vis, one of the westernmost Dalmatian islands that hug the coast of Yugoslavia.

"[Vis is] a rocky, waterless crag that was held by the Partisans and served as Tito's headquarters for several months during the spring and summer of 1944. Too prickly for the Germans to take, it was used as a base of operations for several special British units. From Vis, they made raids on German garrisons in Yugoslavia and kept various Partisan groups armed and supplied.

"But most important to the Allied flyers, there was a primitive 3,500ft gravel runway. For the big bombers it was only suitable for an emergency landing. And once committed, there was virtually no backing out; it was situated



**ABOVE** With the airfield's narrow taxiways crowded with parked aircraft, the larger types were usually moved around with the help of a crash crane. Here an unidentified B-24H is pulled on to the Vis runway after repair by the groundcrew of the 81st Air Service Sqn in November 1944. Note Battle No 69, Burma Bound, in the background.

such that a crippled bomber had little chance of climbing away from an aborted landing.

"Once down, a quick assessment was made of the aircraft's condition. If it was salvageable, a special effort was made to find room for it on the tiny airfield. If not, it was bulldozed to make room for other aircraft. The crews then waited for transport back to Italy via a fast torpedo boat or a C-47."

Depending on wind direction — or not if the crippled aircraft had only limited options — both approaches were problematic. One runway threshold involved a steep close approach over the surrounding mountains with an upslope to the runway end; landing short could be disastrous, but landing long and not stopping in time at the other end past the over-run meant an unsurvivable 100ft (30m) drop over the cliff down to the rocky beach. Landing in the opposite direction raised the slightly less

terrifying possibility of running down the unprepared slope past the end of the runway with its attendant dangers. There was no doubt that the runway at Vis, at least for a heavy bomber, and particularly for a damaged one, was an emergency runway only.

Second Lieutenant George McGovern, later Senator McGovern and presidential hopeful, flew the B-24 while serving with the 741st BS, 455th BG. On December 20, 1944, his 30th combat mission, he flew B-24 *Dakota Queen* to the Skoda tank manufacturing works at Pilsen in Czechoslovakia. An hour from the target No 2 engine had to be shut down and feathered, and the aircraft struggled to keep up with the formation. Less than a minute before the bombs were to be dropped No 3 engine was hit by flak. The oil pressure dropped so suddenly that the propeller could not be feathered and windmilled until the engine caught fire.

**Castle Bromwich-built Supermarine Spitfire Mk VC (Trop) JK544, code letter "M", operated with the RAF's No 352 (Yugoslav) Sqn — the first Yugoslav-manned fighter unit to be formed in the Mediterranean — from Vis during January–April 1945. Artwork by JUANITA FRANZI/AERO ILLUSTRATIONS © 2015**







VIA AUTHOR

**ABOVE** Another one bites the dust — B-24H 42-52729, “White W”, of the Venosa-based 830th BS, 465th BG, lies abandoned at the end of the Vis runway. The details of its loss remain unknown, but it has shed its No 1 propeller and No 3 has been feathered. The bomber sported Bugs Bunny artwork and had racked up at least 56 missions.

McGovern dived the B-24 in an attempt to extinguish the fire and continued to try feathering the propeller; finally, one last attempt met with success. It was obvious that they could not get back to base, but the navigator advised that they could reach the Vis emergency runway in less than an hour. Everything loose was thrown out to lighten the aircraft, and despite the No 3 engine bursting into flame again late in the flight, McGovern touched down on the threshold of the runway. With tyres smoking from the heavy braking, the aircraft swung off the end of the runway, still travelling fast. The entire crew escaped unhurt and was flown back to Italy by C-47. Some months later McGovern was awarded the Distinguished Flying Cross for his “high degree of courage and piloting skill”. Not all diversions to Vis ended in such a fortuitous way, however.

### NO ROOM AT THE INN . . .

On May 30, 1944, 2nd Lt William Cubbins of the 723rd BS, 450th BG, was flying as copilot aboard B-24H-FO serial number 42-95296 as part of a full 15-group 15th AF mixed mission of B-24s and B-17s to attack targets in the Vienna / Wiener Neustadt area. It was Cubbins’s 13th mission. Sporting white fins on its aircraft, the 450th BG became known as the Cottontails.

The forming up for the mission did not go to plan, as the 449th BG was running late and was positioned behind, instead of in front of, the 450th. After reaching the bomb run’s initial point (IP), the 449th tried to regain its position in the bombing sequence by cutting the corner in the

turn, causing the 450th to “break left to avoid a sky full of crunched bombers”. The 450th had no option but to fly past the target, reverse course and bomb in the opposite direction.

During the bomb run Cubbins’ aircraft was hit by flak — a shell which did not explode, smashing into the No 3 engine. There was no fire, but a lot of fuel was lost. Moreover, the starboard wing appeared to have more dihedral than it should and was flexing more than usual. Considerable height was lost while the aircraft was stabilised and turned back towards Italy. It became quickly obvious, however, that they were not going to make it back to Manduria. The only options were to abandon the aircraft immediately, resulting in certain capture, hang on until they reached Yugoslavia and hope to meet the Partisans, or try to reach Vis. The latter won the crew debate.

The aircraft and the fuel lasted long enough to cross the Yugoslavian coast, at which point Vis tower was called for permission to land. The crew was astonished to hear the response from the British controller: “Negative, sir! Jump your crew over the island. We don’t have any more room for aircraft on the field”. From overhead the crew could see he was right. As Cubbins recalled in his memoir, *The War of the Cottontails: Memoirs of a WWII Bomber Pilot* (Algonquin Books, 1989):

“Wrecked and seemingly flyable B-24s, B-17s, a B-25 or two and other junked aircraft lined one side of the small runway. The other side comprised parked fighters and the ordnance areas. We’d have to jump.”



VIA AUTHOR x 2

**ABOVE** A significant milestone, B-24J serial number 44-41064 was the 5,000th Consolidated-built B-24, and was thus given the name V Grand. The factory workers who built the aircraft each found a space on the airframe for their signature and the mass-autographed bomber was then photographed over the rugged terrain near San Diego on an early test flight.



**LEFT** The autographs remained when V Grand went into combat with the 780th BS of the 465th BG. The aircraft was forced to divert to Vis twice, each time requiring a new engine. Here a pair of engineers replace the flak-shattered bombardier's window at the 780th's base at Pantanella, near Foggia.

They flew over the island along the axis of the runway and baled out over the airfield. A pair of German fighters flew at them during their descent but inexplicably appeared not to fire. When the crew gathered together on the ground they counted one short; waist gunner Frank Riley had vanished and was never found, despite days of searching. It was thought that he had landed in the sea and drowned, but possibly he had hesitated too long and was trapped in the aircraft, which flew into the sea. The remainder of the crew stayed for three days in the "transient accommodation" — tents — on the other side of the mountains, awaiting transport back to Italy. As Cubbins explained:

"From the ground, the reason for the tower

operator's refusal to let us land on the airstrip was even more obvious than it had been from the air. The place was a junkyard. Most of the bombers were total wrecks. Many had been bulldozed from the runway to their final resting places, and all had been stripped of serviceable equipment by the Commandos and Partisans.

"Looking up at the mountains surrounding the airfield, I was thankful we had been refused permission to land. With one engine out and a weakened wing, we might not have made it. The fire-blackened skins of a number of aircraft carcasses bore grim testimony that some had made it the hard way. I wondered how many men had died trying to land on that mountain-locked strip."





**ABOVE** A member of the 81st Air Service Sqn poses on the remains of an unidentified Ford-built B-24 which ended its usefulness with a collapsed nosewheel after a crash-landing at Vis; a couple of oil barrels take the strain instead. The bomber appears to have taken a flak hit in the nose, which has destroyed the Emerson gun turret.

The airfield was by no means isolated from enemy attack, despite the inability of German forces to capture the island. German fighters made sporadic strafing attacks on the airfield, and Cubbins writes of being woken on his first morning on the island by the sound of an air raid siren and exploding bombs. As an airman, it was his first experience of being on the receiving end of a bombing raid:

"The German bombs had been small and few in number; nevertheless, I'd felt totally helpless. For the first time I wondered what it was like to be caught beneath our massive bomb drops."

### INCHES FROM DISASTER

Known as the Black Panthers, the 460th BG was another 15th AF B-24 group whose aircraft found a need for emergency landings at Vis. On July 15, 1944, 2nd Lt Leroy "Ted" Newby, a bombardier with the 763rd BS, found himself scheduled to fly with Charlie Hammett's crew on another sortie to Ploesti as part of a mission comprising 600 heavies and associated "little friends".

Living up to its name, the crew's usual aircraft, B-24H-DT serial number 42-51084, *Hangar Queen*, was unserviceable, so they were allocated another anonymous squadron B-24 for the day's mission. The pilots of the 460th BG had been briefed to climb to 24,000ft (7,300m), about the best a skinny-winged Liberator could reach with full fuel and bombs. The wide-chord B-17s jinked in formation 6,000ft (1,800m) above them. Some aircraft struggled on the climb, dropping a 500lb bomb or two to be able to continue the climb before they stalled. To drop out of formation and straggle was to invite certain death from flak or fighters.

As Ted Newby's B-24 approached Bucharest,

No 3 engine was damaged by flak and began to lose oil pressure, followed quickly by the loss of superchargers on No 1 and No 2. The crew held off feathering No 3 for too long and it began to windmill. Newby salvaged the bombs and a quick descending turn was made until they were heading back towards Italy at 13,000ft (4,000m), slowly descending owing to the drag from the windmilling propeller, leaving behind a trail of everything jettisonable except the turret guns, without which the bomber would have been a complete "lame duck". Italy was clearly not an option, but Vis beckoned. Friction from the windmilling propeller had caused a small fire in the propshaft, fuel was leaking from the engine and the vibration from the propeller was becoming intense. Newby explained what happened next in his book *Target Ploesti: View From a Bombsight* (self-published, 1983):

"The 'plane shuddered so much my jowls shook; I could actually feel my cheeks shaking like a bowl of jello on a bumpy road. It's funny how your mind works in stress situations like this. I thought of the popular [Glenn Miller] song *It Must Be Jelly* ('Cause Jam Don't Shake Like That).

"The propeller and shaft finally tore loose from the engine, cut through the fuselage, and spun its way down to the ground. Actually, the departing propeller was a blessing in disguise. Suddenly all was serene again, and we picked up 12 m.p.h [19km/h]."

The B-24 was now assured of reaching the island — but, when committed for the landing, the pilot was confronted with a small biplane taxiing on the runway. The landing was held off until past the biplane and the B-24 dropped heavily on to the runway — no doubt frightening the life out of the Yugoslavian pilot



**ABOVE** B-24J 42-51430, named *The Tulsamerican*, on a test flight in the USA. It was the last B-24 built by Douglas at the company's factory at Tulsa, Oklahoma, under licence from Consolidated. Douglas employees named it, painted the nose art, paid for its construction with war bonds and then ran raffles to win a seat on a test flight.

— with maybe 1,500ft (455m) of runway left. The waist gunners had been briefed about the need for extra braking by all possible means, and their parachutes, with harnesses hooked to the gun mounts, were thrown out of the waist windows the moment the B-24 touched down. The pilots stamped hard on the brakes and, aided by the drag from the parachutes, brought the aircraft to a screeching halt. Newby continues:

"As I reached out to congratulate them on a fine landing, I wondered why both pilots were white as sheets. Neither of them said a word. They couldn't. I turned white too when I climbed out from under the bomb bay and saw the nose of our 'plane protruding out over the edge of a cliff that seemed a mile straight down to the rock-strewn ocean shore. The nosewheel was just inches from the edge.

"When we talked to the tower operator, a pilot himself, he told us it was the finest emergency

landing he had ever seen, and all he ever saw were emergency landings at his field. He had thought we had no chance of stopping in that short distance; he had seen a number of other disabled bombers go over the cliff."

The crew was returned to Bari by boat, and probably thankful for that mode of transport.

### THE TULSAMERICAN

Many of the aircraft crews which made the decision to head for Vis didn't even make it that far, their aircraft so badly damaged that they had to be abandoned over Yugoslavia, or went out of control and crashed or were ditched in the Adriatic. One such was the last B-24 built by Douglas at Tulsa, Oklahoma, from parts fabricated by Ford at Willow Run, near Detroit. This was B-24J-10 serial number 42-51430, named *The Tulsamerican* at the factory and paid for by Douglas employees with war bonds.

**Spitfires and B-24s lined up alongside each other at Vis in January 1945. Neither Spitfire MH583 nor B-24 42-78274 was to survive the next four weeks; the former taxied into a Bell P-39 Airacobra on Vis on February 17 and the bomber, named *Cocky Crew!*, was lost in a landing accident at its home base at Castellucia in Italy on February 7.**

VIA AUTHOR







**ABOVE** *The furthest of the main central Dalmatian islands from the coast, Vis was used as a military base for the Yugoslav Army from the 1950s until the late 1980s, but the resulting isolation prevented its over-development and it is now a popular tourist destination with a reputation for excellent seafood and the local white wine, Vugava.*

Operated initially by the 722nd BS of the 450th BG, it was transferred after depot servicing to the 765th BS of the 461st BG and given the Battle Number 24.

On December 17, 1944, on Mission No 137 for the 461st and the 17th for the aircraft, *The Tulsamerican* flew to the Blechhammer South oil refinery, near Azoty in Poland. The bomber was damaged by fighters over the target, and, having lost two engines, the crew made the decision to head for Vis. With the hydraulics severely damaged, the undercarriage had to be manually extended via handles in the bomb bay. The mainwheels went down and locked but the nosewheel refused to cooperate. The captain, 1st Lt Eugene P. Ford, elected to continue the approach to Vis while the engineer, Tech Sgt Charles E. Priest, tried to kick the recalcitrant nosewheel into action, the plan being to crash-land on the runway without it should it not respond to brute force. While on the final circuit, the other two engines suddenly stopped, leaving Ford no option but to ditch in the Adriatic between the islands of Hvar and Vis. The extended mainwheels, which could not be retracted again, caused the B-24 to nose in heavily and flip on to its back before sinking. Ford, Priest and the navigator, Lt Russell Landry, were killed, but the remaining seven crew members were picked up by Croatian fishermen and taken to Vis for repatriation.

The exact location of the wreck was not recorded — understandable in the circumstances — and despite almost 30 years of searching by the navigator's cousin, who was determined to find closure for his family, the aircraft was only found by accident by a Croatian recreational diver in December 2009. The constructor's plate was prised off the instrument panel and, when

cleaned, revealed the serial which permitted positive identification of the wreck. Allied and Axis aircraft litter the seabed in the Adriatic, the vast majority of which will never be investigated or identified.

### THE ISLAND OF HOPE

The airfield on Vis provided an invaluable service to the USAAF well beyond its manning costs, saving hundreds of aircraft and thousands of lives. On one day in 1944 it is reported to have accepted 37 B-24 landings in both directions, sometimes simultaneously.

After German forces in Yugoslavia retreated north, the repair crews and personnel of No 352 Sqn moved in February 1945 to Zara (now the Croatian city of Zadar) on the mainland, where No 351 Sqn, now also equipped with Spitfires, joined them. The island was closed to foreigners by the Partisans and progressively converted to a military station, ultimately with more than 30 military buildings including an underground tunnel, a military hospital and facilities for Yugoslav warships. After the war the airfield was abandoned and returned to agriculture to resume its previous use as a vineyard.

This situation lasted until the early 1990s through the break-up of the Socialist Federal Republic of Yugoslavia, although the Yugoslav Army did not fully leave the island until May 30, 1992. Fast-forward to the 21st Century and the abandoned military buildings are now tourist attractions and the island, a short boat ride from Split, is a popular resort for scuba diving, caving, swimming and walking tours. There is even talk of rebuilding the wartime airfield into a modern aerodrome to take tourist flights from the mainland — a fitting tribute to the Allies' invaluable Adriatic eyrie.



# à paris avec *les soviets*

*RUSSIA'S SHOW OF FORCE AT THE 1965 PARIS AIR SALON*



*The undoubted star of the 1965 Paris Air Salon was the gigantic Antonov An-22, which arrived at Le Bourget having flown non-stop from Moscow, and which subsequently dwarfed its compatriots in the static park. The monstrous transport was not open for public inspection during the show, except for one very brief and rather hectic press conference three days after its arrival.*

MIKE STROUD





*Fifty years ago the Soviet Union made good on its promise to send its biggest collection of cutting-edge airliners and rotorcraft the West had ever seen to the 1965 Paris Air Salon. **THOMAS NEWDICK** reveals how it was much more than just a projection of technological prowess — the Russians genuinely needed the sales*







TAH ARCHIVE



**“A**T THE Aero Salon, the Soviet Union will display the biggest collection of Russian transport aircraft and helicopters that foreign specialists have ever seen.” This announcement, from Moscow’s official news agency Tass, was made in mid-May 1965. Five days into the 26th *Salon International de l’Aéronautique et de l’Espace* at Le Bourget that June, the already impressive Soviet contingent grew bigger still. In the words of *Flying* magazine’s correspondent John Fricker, “Russia played its trump in the ponderous shape of the [Antonov] An-22 [seen in the static park at Paris, **ABOVE**] which flopped into Paris like a stranded whale to take game, set and match . . .”

### ***A peek behind the Iron Curtain***

Today it is perhaps not so easy to recall how difficult it once was to examine the aerospace products of the Soviet Union in any detail. With the era of *glasnost* that began in the mid-1980s, Moscow’s commercial and military aircraft became a familiar sight at airshows and exhibitions around the world. The watershed was the Paris Air Show in 1989, where even the dramatic loss of a MiG-29 in a flying display failed to detract from a Soviet presence that included the space shuttle *Buran* and its colossal six-engined Antonov An-225 transporter. Since then, a major aerospace exhibition without a Russian presence is almost unthinkable.

In 1965 things were rather different. The Soviets had brought their wares to Le Bourget before, but never on such a scale. Moscow delivered on its promise, bringing to Paris its biggest collection of transports and helicopters to date. The An-22, which arrived at the show on Tuesday June 15, was the world’s heaviest aircraft and was making its debut in the West. Nevertheless, at the press preview on the previous Thursday, the Soviets were able to put together a collection of no fewer than ten aircraft types.

Dominating the static park before the arrival of the mighty An-22 was the Ilyushin Il-62, inevitably described by the contemporary press as a VC10 clone (the British airliner failed to make it to Paris, the British Aircraft Corporation blaming the demands of customer Ghana Airways for the no-show). At the time, the Soviet long-haul airliner was undergoing pre-service trials with Aeroflot, to which the aircraft on show, CCCP-06176, the third prototype, had so far contributed 500hr.

Further new equipment was provided in the form of the Antonov An-24 feederliner and the short-haul Tupolev Tu-134 jetliner. Together with the Il-62, the twin-jet Tu-134 would begin scheduled passenger operations with Aeroflot in the course of 1967. More familiar were the Antonov An-12 airlifter, the four-turboprop Ilyushin Il-18 and the Tupolev Tu-124, the conceptual precursor to the Tu-134, all of



*Fitted with attractive wheel fairings and in a stylish white, grey-blue and red colour scheme, the Mil Mi-8 made a positive impression on the Western press, *Flight* noting that this was "a modern and handsome replacement for the Mi-4" which "gave a very comfortable ride".*



which had been introduced into service by this date. On the rotary-winged side, the Soviet Union unveiled the Mil Mi-6, Mi-8 and Mi-10 helicopters at Le Bourget. Last but not least was the high-performance A-15 sailplane, which *Flight* judged "the most beautiful thing the Russians have brought to Paris".

The trio of Soviet helicopters took to the air as one of the highlights of the two days of flying displays, and were joined in clear skies by the An-12, An-24 and the new Tu-134. In particular, the Mi-6 — at the time the world's largest helicopter — won plaudits for its display, *Flight* describing it as "a stately sight". The Mi-6 and Mi-10 both flew to Paris in stages, the Mi-10 flying-crane with a large LAZ coach slung between its extended undercarriage legs.

The Mi-8 on show, CCCP-06181, was the fourth flying prototype (the fifth in total), which had been completed in May 1964. The previous winter the helicopter had been adapted to an airline configuration, after which it was known as the V-8AP. (Before its entry into formal service, the Mil design officially retained the V-8 designation, although this was transliterated in English-language brochures of the time as "B-8".) Furnished with comfortable seating for 20, a coat closet and soundproofing, the V-8AP had completed state trials just a month before the show, and once at Le Bourget was an ideal platform with which to impress the world's aviation journalists. *Flight* found the helicopter "noticeably smooth and comfortable, with a very acceptably low noise level".

GRAHAM SKILLEN



*The shapely V-tailed Antonov A-15 glider at Paris before the morning removal of its protective tarpaulin. The aluminium glider made its first flight in March 1960 and quickly set a number of world records. Some 350 examples were ultimately built.*



MIKE STROUD

**ABOVE** The second prototype Tupolev Tu-134, CCCP-45076, took pride of place at Paris as the Soviet Union's latest short-haul twin-engined jetliner. It was to survive only another seven months, however, crashing on January 14, 1966, during one of its many test flights, when the rudder was over-extended, putting the airliner into a dive.

After the initial surprise of the scale of the Soviet presence, Western observers were left to question just why Moscow had appeared in such force. Inevitably, the presence of the Soviet hardware was seen through the prism of Cold War politics. For some, the unprecedented opportunity to examine the Soviet Union's latest aircraft at close quarters was overshadowed by the people chaperoning them, and the gulf between aerospace marketing in the Eastern and Western blocs. After being rebuffed by the Russian-speaking representatives, John Fricker, in his report for *Flying*, noted that "Russian salesmanship still has some way to go".

This was true, of course, once the Soviet sales teams pitched up in Paris. But this was not their natural environment, and their chances of making sales to Western airlines in the French capital were almost as slim as those of BAC, had it tried to pitch its VC10 to Aeroflot. It was also new territory for the Soviets, coming in the wake of the so-called "Khrushchev Thaw". Despite this, the Soviets did at least plan a genuine sales push at Le Bourget, a fact confirmed by Boris Kharchenko, chairman of Aviaexport, the Soviet state export concern, in the run-up to the show.

### **A Parisian shop window**

The fact that the Soviet delegation included three of its most famous aircraft constructors — Andrei Tupolev, Oleg Antonov and Mikhail Mil

— suggests that Moscow was genuinely serious about selling its wares. Only the 71-year-old Sergei Ilyushin remained at home. "We haven't brought our aircraft all the way here just to show them off", Vitaly Vasin, Vice-President of Aviaexport reminded *Der Spiegel*. "We also want to sell them."

At this time Moscow built aircraft almost exclusively for its own operators, and for those of the Eastern Bloc. But the Soviet Union under Leonid Brezhnev was now looking to expand its global influence, not least in order to earn hard currency overseas while the Soviet economy stagnated. From now on, Soviet aerospace products would become increasingly common around the world. With that in mind, the Russian rendezvous at Paris was a chance to put Soviet aircraft in a shop window for all to see — not just baffled Westerners.

In the West it was quite common to see descriptions of Eastern Bloc and other operators in the Soviet "sphere of influence" having Soviet equipment "forced" upon them by their masters in Moscow. This was generally unfair, and the market among the satellite states was not as "guaranteed" as many in the West might have judged. If anything, by the mid-1960s, the pressure was on Soviet industry to sell its products to anyone who might want them. In the Middle East, for example, Moscow's high-profile military "support" for the Arab nations had very





**ABOVE** Essentially a scaled-down Tu-104, the Tu-124 was designed to a 1957 specification for a jet-powered replacement for the Ilyushin Il-14 piston-engined short-hauler on domestic routes. The prototype made its maiden flight in March 1960 and the Cookpot, as it was designated by Nato, began Aeroflot services in October 1962.



**ABOVE** Anything you can do . . . we can do bigger! Mil Mi-10 СССР-04102 was by far the most unusual and impressive helicopter at the 1965 Paris show, startling spectators with its distinctive long-stroke quadricycle undercarriage of 19ft 8in (6m) track, which separated the fuselage from the ground by some 12ft 3½in (3.75m).



**ABOVE** Nestling between the Soviet jet hardware at Paris, the Antonov An-24 was open to inspection by the press and public. Similar in configuration and size to the West's extremely successful Fokker F-27 Friendship, the turboprop-powered An-24 (Nato codename Coke) was designed to operate from unpaved airfields of limited size.



**ABOVE** In 1965 the Mil Mi-6 was still the largest helicopter flying anywhere in the world, despite appearing to be smaller than the Mi-10, itself a development of the Mi-6. Since its first flight in 1957 the Mi-6 had set numerous helicopter world records for speed and payload-to-height. Note the stub-wing fitted to unload the rotor in flight.



*Of particular interest to the Western press was the Ilyushin Il-62, virtually a carbon-copy of the British BAC (originally Vickers) VC10. Flight's report found the four-engined jetliner lacking in sophistication, pointing out that "there is a lot of snap-head riveting in the airframe, the flush-riveting is not flush and the doors are poorly fitted".*



**RIGHT** The Il-62's wing incorporated a "dog-tooth" contour and various twists to improve the four-engined jetliner's stall characteristics after initial problems with its low-speed behaviour.



little to do with ideology and everything to do with filling up the Kremlin's depleting coffers, at least until the Arab/Israeli War of Attrition during 1967–70. The same applied to Soviet-made civilian airliners and rotorcraft; by 1965, their sale to foreign clients was not part of a plan to expand the communist footprint, but rather to defer economic collapse at home.

### **Cash and carry**

To be sure, the prices quoted by the Soviet "salesmen" at Paris — a team of 40 in all — were attractive, coming in lower than their Western counterparts. The Tu-134 was on offer for just under \$2 million, inclusive of spares and tools, while the twin-turboprop An-24 carried a price tag of around \$800,000. The Soviets also offered their aircraft in exchange for precision machinery or Western-made electronics products. Those paying in cash could meanwhile expect a discount.

Reflecting another Cold War tendency, Western reporters were quick to see through the civilian guises of the Soviet aircraft and instead pinpoint their military potential. So it was that Oleg Antonov's An-22 very-high-capacity freighter, despite its smart pale blue cheat-line and subdued Aeroflot livery, was, in the words of *The Aeroplane*, "of sufficient size to orientate its duties towards the carriage of large strategic missiles". The fact that the An-22 was the only

Soviet type not to be open for public inspection only served to confirm Western suspicions.

While there's no doubt that the An-22 played a key strategic transport role for the Soviet armed forces (a role in which, remarkably, it continues to serve), its commercial applications were nonetheless very relevant, especially for operations in remote Siberia and the Russian Far East. Moreover, in bringing an array of "purely civilian" types to Paris, the Soviets were able to contrast their peaceful participation with the positively warlike contribution from American industry. It was a fair point; after all, it is inconceivable that the Convair B-58 Hustler was at Le Bourget to try and win export orders.

As the undoubted showstopper at Paris, the appearance of the An-22 — named *Antei* (Antaeus) after a hero giant of Greek myth — was a coup. The fact that the airlifter arrived late added to the drama, but was surely a reflection of the early stage of the flight-test programme. For its surprise appearance at Paris, CCCP-46191, the last of three An-22 prototypes, flew to the French capital non-stop from Moscow, arriving on June 15 after a flight of 5hr 5min. Its arrival helped deflect some attention away from the crash of the B-58, which occurred just 90min after *Antei* was unveiled.

The An-22 had first flown only a few months earlier, on February 27, 1965, when it made an inaugural flight from Antonov's company



**ABOVE** An exceptionally modern aircraft by contemporary standards, the Ilyushin Il-18 turboprop was designed for international and domestic routes. The prototype, named Moskva, first flew in July 1957 and the type had entered Aeroflot service by the spring of 1959. This example, CCCP-75581, was the first long-range Il-18D.

airfield at Kiev to the nearby Long-Range Aviation base at Uzin. The An-22 entered series production at Tashkent in Uzbekistan the following year and continued to be built until 1975. In total 64 were completed for the Soviet Air Force, and a handful remain in Russian Air Force service in 2015, some 40 years after the end of production.

For all its impressive dimensions and capabilities, the An-22 was met with a somewhat underwhelmed response from the British journalists on hand. "The An-22 cannot be said to represent any real advance in the state-of-the-art, and in its present form . . . appears to have little commercial potential", reckoned *The Aeroplane*. The aircraft, the same journal noted, may have been big in terms of gross weight, but the wingspan of the Bristol Brabazon remained greater. The British airliner was, *The Aeroplane* reasoned, still the biggest aircraft yet built.

A 720-seat passenger version of the An-22 was suggested at Paris, this introducing two decks

as well as a longer, slimmer fuselage. Officials suggested the behemoth could fly non-stop from Moscow to Lisbon. While such a derivative never materialised, a model of another future airliner was the recipient of much attention at the 1965 Salon when it was revealed on Monday June 14. Before the show, Western observers were still unsure as to what the promised "Tu-144" model might represent, *Flight* wondering if it was indeed a supersonic airliner, or perhaps a Lockheed C-5 Galaxy equivalent.

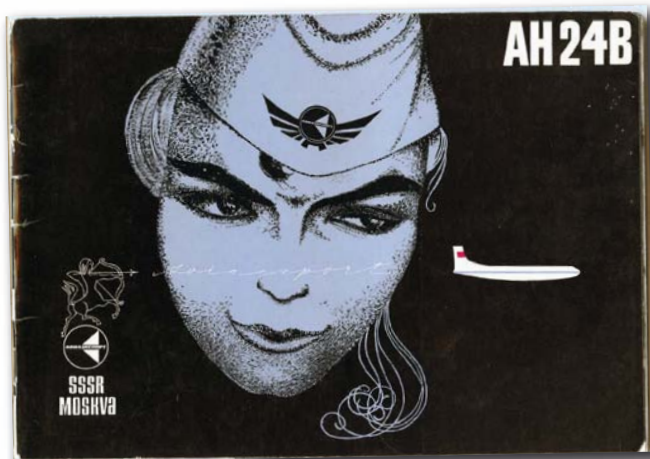
With a first flight for the Tupolev Tu-144 already set for late 1968 (a target achieved — just — on December 31 that year), it was presumed that the model on show represented the definitive design for the Soviet supersonic transport (SST). Earlier in 1965, Paris had been the scene of the arrest of an Aeroflot employee by French intelligence agencies, who found blueprints of Concorde's undercarriage in his briefcase. Unsurprisingly, the resulting Tu-144 owed much to the Anglo-French design. Western

MIKE STROUD

**Big. But not as big as a Brabazon.** Such was the rather peevish reaction of the British aviation press to the An-22 at Paris. It was nevertheless a remarkable sight on its arrival and one that could hardly fail to impress, with its 211ft 4in (64.4m) wingspan and four 15,000 s.h.p. Kuznetsov NK-12MA turboprops, each driving a contra-rotating pair of four-bladed propellers.







**ABOVE** For the first time the Western press was able to get its hands on solid information about Russian types, in the form of brochures prepared by the Soviet Union's Aviaexport agency. Two such brochures available at Paris in 1965 — with parallel text in Russian, English and French — were for the An-24 turboprop and Mi-8 (V-8) helicopter.

observers would finally get to see a production example of the Tu-144 in the flesh at the 1973 Paris Air Show, a debut appearance marred by the aircraft's crash in a nearby suburb.

### **A human exhibit**

Should the 1965 visitor still be in any doubt about Soviet aerospace prowess, in the space pavilion spectators could gawp at Yuri Gagarin himself, signing autographs alongside the *Vostok I* capsule in which he had become the first human in space. "One look inside the claustrophobic interior of the Russian space sphere, and you can understand even the Soviet Union looking good to the returning astronaut", Fricker wryly quipped.

According to contemporary reports, both Japan Airlines and SAS expressed interest in acquiring Soviet aircraft at the 1965 show, the former in order to help establish a trans-Siberian route from Tokyo. The Scandinavians, too, saw the potential of bringing in Soviet equipment

in order to ease the process of gaining access to routes into the Soviet Union. Both would ultimately stick with Western equipment.

Regarding the hoped-for aircraft sales to the West, the situation was summed up in a bulletin from United Press International, from which this excerpt quotes Aviaexport's Vitaly Vasin: "The Soviet Union is ready to sell the West airliners and helicopters, for cash or on credit . . . Vasin conceded he had received no orders. 'But we just got here', he added".

With its large-scale presence at Le Bourget, Moscow had indeed put down a flag for its aerospace products. It was here to stay, but it would be many more years before its aircraft met full acceptance in the West — some might argue that this is still to happen. In the meantime, and despite the scepticism surrounding Soviet sales techniques, designs such as the An-24, Mi-8 and Tu-134 would win sales to operators around the world, and would become true export successes in their own right.



**Looking handsome in its Aeroflot scheme, the Antonov An-12 was one of the three Soviet transports that participated in the flying display at Paris. The other two were the An-24 and the Tu-134, along with the Mi-6, Mi-8 and Mi-10 helicopters.**

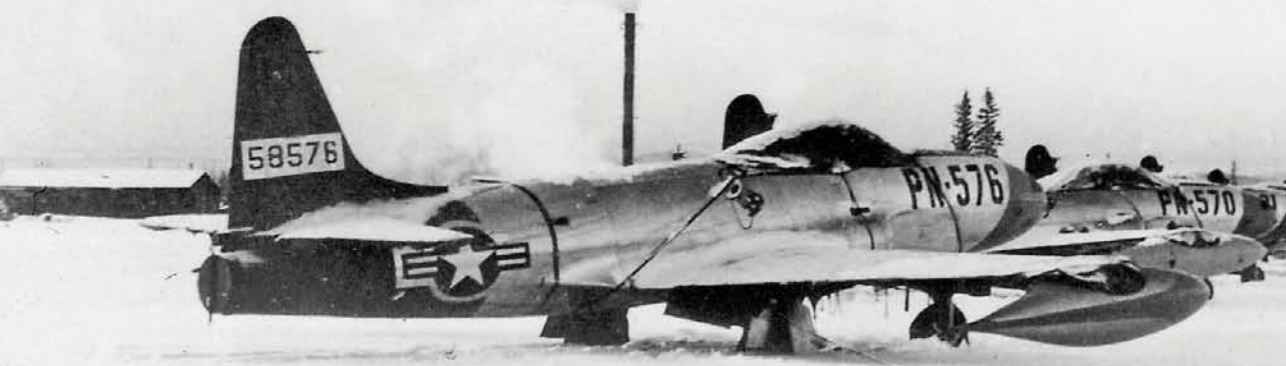


MIKE HOOKS

# Blowtorches ❄️ & Big Birds

## SUB-ZERO INC Part Two : the Post-war Years

In the second half of his article on the history of Alaska's Ladd Field and the military cold-weather testing units based there, **DAVE STERN** explores the remote airfield's post-war activities, including the testing of Boeing's mighty B-29, preparing the USA's first generation of jets for Arctic operations and undertaking trials of America's home-made "doodlebug"



USAF VIA AUTHOR

**B**Y THE END of the Second World War, the Cold Weather Test Detachment (CWTD) at Ladd Field, near Fairbanks, Alaska, had proven its worth with its extensive research into, and testing of, the effects of sub-zero temperatures on aircraft since its establishment in 1940. The trials had suffered some misfortunes, however, a number of types including several Consolidated B-24Ds, a Boeing B-17F, at least one Bell P-39Q Airacobra and a North American P-51 Mustang having been lost on testing duties during 1943-44. In 1944 a North American B-25H had disappeared while flying south from Ladd to Kodiak Island Naval Air Station and was never found.

On September 10, 1944, the prototype of Fairchild's new XC-82 cargo and troop transport

aircraft made its first flight from the company's factory in Maryland. Originally designed to be built with non-strategic materials — plywood and steel rather than aluminium — the twin-boom transport incorporated a rear-loading ramp with wide clamshell doors for easy loading from trucks. Fitted with a pair of 2,100 h.p. Pratt & Whitney (P&W) R-2800 Twin Wasp engines, the transport was found to be underpowered, despite a production batch of 100 already having been ordered and under construction.

### PUTTING THE PACKET THROUGH ITS PACES

Despite its flaws the type would enter USAAF service, and so would have to be tested by the CWTD. Accordingly, one C-82A, 44-22964, was posted north to Ladd Field for cold-weather





**MAIN PICTURE** *The value of experience — during the 94th FS's transit through Canada in late 1947, the unit had parked its Lockheed P-80Bs wingtip-to-wingtip in the icy conditions. As each jet taxied out, its neighbour received a blast of melted snow that immediately froze, requiring further time-consuming work for the groundcrew. By the time the unit reached Ladd Field, a method of parking at a 45° angle to the flightline had been devised, as seen here, to avoid the increased workload. ABOVE* A Boeing RB-29 of the 46th RS on a post-war mission over Alaska.

testing during January—February 1946, under the care of an experienced CWTD C-46 maintenance crew assigned to the Packet.

The comparatively mild late 1945–46 winter temperatures — averaging -26°F (-32°C) — were far from ideal to test a new type, but the CWTD's standby rule — if Ladd temperatures are not cold enough, fly around the bush communities of Tanacross or Galena, where it will be considerably colder — were put into action. The new transport found the Alaskan winter troublesome and ultimately flew on only 23 days of its allotted 56-day test syllabus.

The R-2800-22 Twin Wasp engines consistently ran extremely rough, cutting out periodically when no carburettor heat was applied in sub-zero temperatures, although judicious application of

the auto-rich controls kept the engines running more smoothly. The early morning engine warm-ups did not eliminate violent engine backfiring that damaged the carburettor-intake scoops and seized its heat shutter.

Landing descents caused excessive engine cooling even with the cooling flaps closed, the pilot having to keep the r.p.m. high enough to prevent the engines from stopping. An oil-dilution valve stuck open, causing the oil tank, mounted higher than the carburettor, to drain into it, and the port engine burned excessive fuel in comparison to the starboard engine despite its carburettor being removed, bench-tested and adjusted before reinstallation. The engine continued backfiring, thus bending the carburettor air-intake scoop out of shape every time.



**ABOVE** Production Bell P-59A Airacomet 44-22610 spent some time at Ladd Field during late 1944 and early 1945, when it was extensively tested by the CWTD. On the port side of the fuselage the jet fighter was adorned with Chicago Tribune cartoonist Bill Holman's character *Smokey Stover*, but apparently not on the starboard side.

During sub-zero flights the oil-cooler shutters had to be closed or the oil would freeze and congeal. Engine priming required for initial engine starts flooded the engines, causing severe backfiring and exhaust-collector-ring damage. Cockpit undercarriage warning lights were too bright, requiring a rheostat, and throttle-linkage settings became overly sensitive; very small adjustments to engine power caused excessive manifold-pressure changes, thus demanding constant resetting. Furthermore the cockpit heater unit was totally inadequate when flying in sub-zero temperatures and the fluxgate compass precessed by up to 30° from the correct heading, confounding the instrument shop personnel as to the reason why.

On the positive side the Packet arrived with brand-new Goodyear rayon snow-and-ice tyres impregnated with spring-cleats for better traction. A larger propeller anti-icing system tank was requested, the heated wings shedding

ice reliably in light to medium-heavy icing conditions. Following its stint with the CWTD the Packet was damaged beyond repair during a landing accident at Bellevue-Offutt Air Force Base in Nebraska on July 18, 1946.

Also scheduled for cold-weather tests at Ladd was the USA's first jet fighter, the Bell P-59A Airacomet, requiring the Standard Oil Corporation of California to leave caches of JP-1 kerosene fuel along parts of the ALSIB (Alaska—Siberia) route used to deliver American fighters to the Soviet Union's front-line airfields during the Second World War. [See Part 1 of this series in TAH11 for more on the ALSIB route — Ed.] This allowed P-59A 44-22610, bearing the name *Smokey Stover*, to fly to Ladd Field in stages during December 1944.

Local Alaskan aviators were surprised and delighted to inspect the handsome but strange propless fighter. Several early-production Lockheed P-80 jet fighters also briefly visited

**The Fairchild C-82A Packet was also extensively tested at Ladd. The type was used to fly para-drop and troop-carrying missions as part of Exercise Yukon, undertaken during 1947–48 to assess and develop "air transportability methods in the Arctic".**

NARA VIA AUTHOR







NARA VIA AUTHOR

**ABOVE** Boeing B-29A 42-24612 Klondike Kutey trundles along the Ladd Field taxiway for another flight test. The Superfortress was the largest aircraft tested at the CWTD until an early production example of the enormous six-engined Convair B-36 visited the base after the war. Klondike Kutey later served at Ladd with the 72nd RS.

Ladd in order for the aircraft manufacturer to modify production P-80B models for future cold-weather operations, of which more later.

#### BIG BIRDS AT LADD

In late 1944 the Air Staff understood that the Boeing B-29 Superfortress would remain the backbone of the USAAF's post-war strategic bomber force until the next generation had been developed, so it too was subjected to the CWTD's sub-zero flight-test syllabus. As part of Project E-4017, the plan was for six "winterised" B-29s (designated B-29Fs) to fly to Ladd for testing during the 1944–45 winter season. Only three are known to have been tested at CWTD, however: 42-24612, named *Klondike Kutey*; 45-21763 (*Northern Star*) and 42-24768 (*Amiable Amazon*). These would provide data on sub-zero flight operations for Arctic modifications to B-29s as part of the Project *Gem* upgrade programme undertaken during 1947–49, in which examples of the type were modified for post-war roles, including those with the codenames *Ruralist* (aerially-refuelled B-29s), *Superman* (tankers) and *Silverplate/Saddletree* (atomic-bomb carriers).

Initial problems with the Superfortress at Ladd included inadequate primer systems, an unacceptable interior heating system — especially for the pressurised tailgunner's compartment — and revised engine-start procedures which had to be developed to prevent cylinders from flooding.

Standard wartime heavy oils were replaced with a newly developed synthetic oil, AN-05 Grade 1100A, which was tested on several B-29 engines, then certified for Arctic operations. Despite the big bombers being fitted with Andover auxiliary

power units in the rear fuselage, which provided electricity for the numerous onboard systems and starting the engines, oil- and engine-preheating was still necessary.

The B-29's Wright R-3350 engines, with their 6.85:1 compression ratio, demanded thorough pre-heating if the outside air temperature (OAT) was -20°F (-29°C) or lower; the frozen engines cranked far too slowly, causing the primer system to flood the engine cylinders and drench the spark plugs. Another problem saw the fabric-covered rudder flexing enough to crack the fabric wide open; a problem necessitating a warm hangar for "dope-and-fab" repairs. Failed components included a propeller-feathering pump, undercarriage microswitches, voltage regulators and a bevy of oil seals plus fuses and lamps. The CWTD also requested snow-and-ice tyres with "bottlecap" cleats to grip ice and snow, rather than slide on the frozen surfaces.

The F-13s (photo-reconnaissance B-29s) and RB/WB-29s (reconnaissance and weather) later assigned to Ladd Field required special fabric coverings for the cockpit glass, wings, engines and tail surfaces. Nevertheless, some photographs show overnight snow packed around F-13 and WB-29 engine cylinders and blanketing uncovered fuselages and wings. Clearing the snow and ice rapidly burned up calories, thus diminishing the groundcrew's efficiency when preflighting B-29s, F-13s and WB-29s in sub-zero temperatures. Ground-heaters and covers quickly became highly desirable items.

When the newly-formed Strategic Air Command's 46th Reconnaissance Squadron (RS) — redesignated the 72nd RS in October 1947



USAF VIA AUTHOR

**LEFT** A 1942 detail photograph of a Boeing B-17 fitted with newly-developed winter tyres incorporating “bottletop” cleats to improve grip on snow- and ice-covered runways. The war years were busy for the CWTD, the unit’s extensive tests yielding much invaluable data for the development of cold-weather aircraft operations.

**BELOW** The CWTD motif — a polar bear holding a bomb — on the fuselage of a B-17B at Ladd Field. When the war ended testing continued at Ladd, but at a reduced level.

NORM TAYLOR VIA AUTHOR

— arrived at Ladd in June 1946 to begin top-secret photographic/electronic intelligence (ELINT) reconnaissance missions with F-13s, it encountered the same problems already addressed during wartime tests at the CWTD. These included persistent gasket leaks, ice forming on propeller hubs and undercarriage struts going flat. Long-duration Arctic operations also demanded improved de-icer “boots” and the replacement of Hamilton Standard hydraulic propellers with Curtiss Electric reversible props.

Warming one frozen engine and oil tank at -40°F (-40°C) required more than two hours with ground heaters. Spark plugs continually fouled from excessive moisture buildup; and bomb bay doors froze immediately after tugs had pulled the aircraft from their warm hangars, owing to the buildup of condensation on the airframe while inside.

After one particularly heavy snowfall several Cletrac vehicles were needed to tow a B-29 around the flightline for a mission. Some B-29s froze in place owing to brake shoes freezing solid after moving from a warm hangar into sub-zero temperatures. A stiff breeze added the windchill factor to the equation, causing B-29 nose glazing and side blisters to crack. Engine-exhaust manifolds developed hotspots that burned holes in them, thus contributing to extra maintenance and reduced engine overhaul times until the problems were resolved.

### AMERICA'S DOODLEBUGS

During a wartime visit to London the USA's Assistant Secretary of War, Robert A. Lovett, survived an attack by one of the many thousands of pilotless V1 flying-bombs sent to target the

British capital during 1944–45. Lovett's immediate reaction was to order the USAAF to develop its own robot bombs. As a result, a USAAF transport aircraft, loaded with salvaged V1 parts, departed England and flew directly to Wright Field in Ohio. Ford Motor Company engineers then set about reverse-engineering the flying-bomb's Argus As 014 pulsejet engine, while Republic copied the airframe and Jack & Heintz of Cleveland, Ohio, rapidly copied the gyro-control system.

By September 1944 the first of 13 prototype Republic-Ford JB-2s was complete, the American iteration being essentially similar to the V1, but slightly less than 2ft (0.6m) longer and with a greater span. Some 1,391 were built and entered service with the USAAF as the JB-2 and with the US Navy as the KGW-1 from January 1945. The aircraft was given the name Loon.

Loons were launched from land, ships and submarines as well as being air-launched from a Boeing DB-17 and a DB-29 (DB — Director Bomber). Under the auspices of the USAAF's 1st Experimental Guided Missiles Group (EGMG) at Eglin Field Proving Ground in Florida, and according to the directives of Project 9-46-1-CW, an initial batch of JB-2

Loons arrived at Ladd Field's Cold Weather Material Test Unit (CWMTU — as the CWTD was redesignated after the war) in January 1947. Test flights by the 321st Squadron Armament Group were scheduled for the winter of 1947–48, to be followed later by DB-29 air-launches.

Unfortunately the metal ramp for ground-based launches of the Loons did not arrive, and the men of the 1st EGMG constructed a somewhat crude 40ft (12m)-long wooden ramp with metal rails, set at an inclination of 6°. Two JB-2s successfully







completed groundchecks, with the PJ31-F-1 pulsejet engine firing up at an OAT of  $-62^{\circ}\text{F}$  ( $-52^{\circ}\text{F}$ ), and the solid-propellant rocket boosters being cold-soaked at the same temperature. A large trail leading to the Tanana River, with its thick solid-ice surface, was chosen as an ideal location from which to undertake rail launches. Naturally, the missiles were aimed away from both Fairbanks and Ladd Field, although there was always a chance that a JB-2 may dive on or close to miner and trapper cabins dotting the local bush. An 8ft (2.4m) x 6ft (1.8m) log cabin shielded with logs, ice chunks and armour plating became the "firing shed".

Problems began immediately. The auxiliary air compressor would not operate at  $0^{\circ}\text{F}$  ( $-17^{\circ}\text{C}$ ) and lower, and a solenoid valve supplying air to the fuel-metering unit operated intermittently or simply failed, starving the engine of fuel. The first launch, on January 19, 1947, followed three hours of pre-heating operations, but the pulsejet failed

to generate sufficient thrust and the Loon crashed 350yd (320m) from the ramp.

The engine was salvaged and repaired to power another Loon. A launch at  $17^{\circ}\text{F}$  ( $-8^{\circ}\text{C}$ ) the following month, on February 28, was rather more successful, the Loon flying 30 miles (48km) before diving into the Alaskan tundra. A launch on March 7 at  $14^{\circ}\text{F}$  ( $-10^{\circ}\text{C}$ ) saw the Loon reach full speed and outrun a North American P-51 Mustang chase aircraft, before plunging into the tundra after a 30-mile flight.

On February 24, 1949, a DB-29 endured three Loon engine misfires before the doodlebug suffered complete engine failure on release from the bomber's wing, after which the Loon stalled and crashed. Two days later the next air-launch was successful, the JB-2 attaining a speed of 350 m.p.h. (560km/h) during a flight of 6min 30sec, at the end of which the Loon dived into the ground.

A second Loon on the same B-29 required a 2min warm-up and, on release, flew for 5min 30sec

**TOP** A Republic-Ford JB-2 Loon leaves its cradle on the outboard section of the wing of a DB-29 during the winter of 1947-48. **BELOW** Ladd Field personnel gather around a Lockheed P-80A-5, one of three tested by the CWTD. Lockheed used the data to winterise production P-80Bs and Cs for Arctic operations, but further modifications would also be required before it was fully ready for year-round service in sub-zero conditions. NARA VIA AUTHOR





USAF VIA AUTHOR



**ABOVE** Frost-covered P-80B 45-8576 of the 94th FS is seen here at Ladd without any wing covers but with the custom-made canopy cover devised for Arctic operations. The rear of the fuselage and fin were painted a high-visibility red to help locate downed aircraft in the snow. Note the famous unit's historic "hat in the ring" motif.

before an unspecified fighter shot it down while it raced along at 405 m.p.h. (650km/h). Several unidentified fuels were tested and a suggestion was made to power JB-2s with a Fairchild J44 turbojet engine, but nothing came of the idea.

#### BAPTISM BY ICE

In October 1947 the 94th Fighter Sqn (FS) of the 1st Fighter Group (FG), based at March Air Force Base, California, received orders from the Pentagon via Tactical Air Command, of which the unit was part, to exchange its 25 Lockheed P-80As for 28 winterised P-80B jet fighters. Flying to Ladd Field using the first section of the wartime ALSIB route, which started at Great Falls, Montana, the exercise would determine whether tactical units could feasibly operate jet aircraft in Arctic conditions. Workshops at March constructed tailpipe covers and wheel chocks, while pilots trained on ground-controlled approach (GCA) procedures, which would be vital for flying the B models in Alaska.

At Great Falls ice-grip tyres were installed on the P-80s and all wheel bearings were thoroughly cleaned and repacked using ANG-14 Arctic grease. On November 1, 1947, the P-80Bs arrived overhead Ladd in formation and landed. Situated away from the main base in Area 300, where hangar space was at a premium, the 94th FS was squeezed into Hangar No 3 with the WB-29s of Strategic Air Command's 375th Reconnaissance Squadron. It did not work well for either unit. The hangar accommodated either two WB-29s end-to-end with two P-80s squeezed between the bomber's wings or one WB-29 and six P-80s in extremely close proximity.

On November 18, 1947, a P-80 was bounced into the air by the extremely rough ice- and snow-covered runway before dropping heavily on to it, the undercarriage collapsing. The aircraft ran off the runway, twisting the fuselage and buckling the tiptanks. On December 1 pilot William J. Reilly of the 94th FS was in the course of a tactical landing pattern in P-80 45-8594 when he pulled up and reported rapidly-rising tailpipe temperatures, immediately requesting an emergency landing. Climbing to 2,000ft (600m), Reilly completed a 360° turn followed by another turn at 500ft (150m). Observers on the ground







project”, yielding a new series of packing seals marked with a tiny yellow dot, which were to be installed in USAF aircraft assigned to the Arctic regions. *[The USAF was formed as a separate branch of the military in September 1947, and its aircraft were redesignated the following year, the P-80 – P for pursuit – henceforth becoming the F-80 – F for fighter – Ed.]*

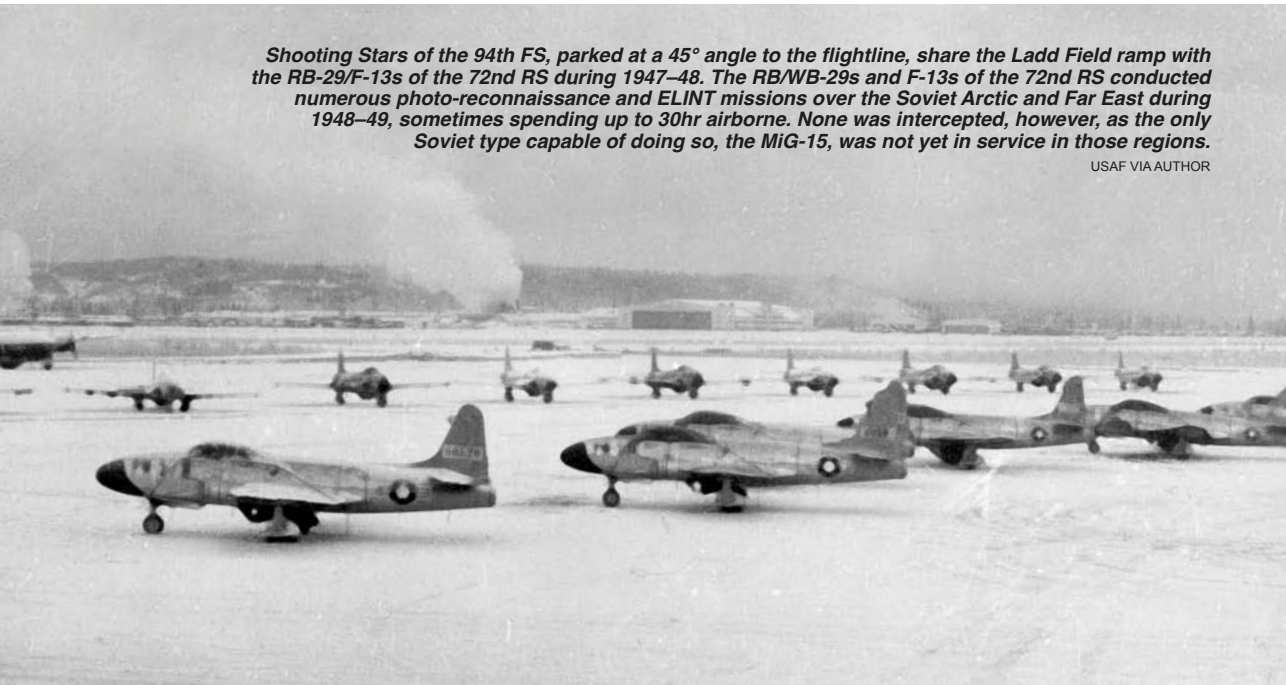
A series of measures was put in place to deal with water contamination in the fuel drums, refuelling trucks and lines and filters of the P-80s' Allison J33 engines; an extensive programme of draining, filtering, cleaning filter screens, opening components and removing sediment buildup-in general was established with the aim of removing as much water and sediment as possible during preflight checks. The fuel supply and other systems of the P-80s were constantly monitored to keep the fuel and filter screens as clean as possible.

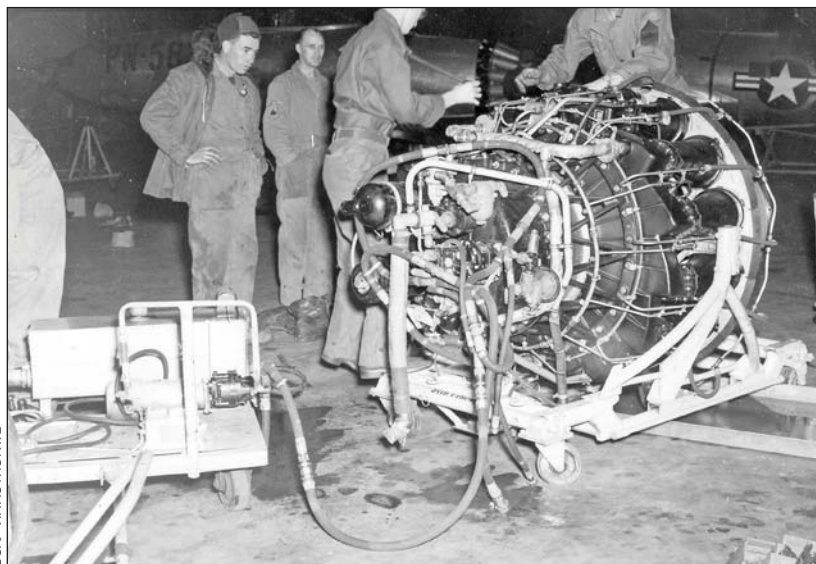
Problems persisted. Cold-soaked jet fuel would not ignite, so the groundcrews used 100-octane gasoline to start the cold J33 engines, resulting in tailpipes warping and cracking; the engineers at Wright Field quickly redesigned the tailpipes. The P-80B's J33A-21 engine did not fare well under sub-zero conditions, either failing or suffering hot starts. *[If the fuel is ignited before sufficient air is flowing around the combustion chamber, its temperature will increase dramatically and exceed the design limits of the chamber and turbine blades, thus causing a failure. This condition is known as a hot start — Ed.]*

Squadron personnel were ordered to initiate their own engine "top end" overhauls rather than swapping an old J33 for a new one; the

*Shooting Stars of the 94th FS, parked at a 45° angle to the flightline, share the Ladd Field ramp with the RB-29/F-13s of the 72nd RS during 1947–48. The RB/WB-29s and F-13s of the 72nd RS conducted numerous photo-reconnaissance and ELINT missions over the Soviet Arctic and Far East during 1948–49, sometimes spending up to 30hr airborne. None was intercepted, however, as the only Soviet type capable of doing so, the MiG-15, was not yet in service in those regions.*

USAF VIA AUTHOR





**LEFT** Engine technicians at Ladd flush an Allison J33-21 centrifugal-flow turbojet engine, as fitted to the P-80. Debris, water and other contaminants caused fuel pumps to fail and filter screens to clog and collapse; all had to be flushed clean, including the fuel and hydraulic lines.

**BELOW** Dressed in their finest Arctic clothing, groundcrew personnel refuel a 94th FS P-80B with JP-1 jet fuel at Ladd. The unit operated from the airfield as part of Alaskan Air Command from October 1947 to mid-February 1948.

overhaul included replacing 90 per cent of the J33 burner liners damaged by the use of gasoline. Establishing an assembly-line system, the groundcrews completed some 27 J33 overhauls in the two-week run up to Christmas in 1947. On February 16, 1948, the 94th FS returned to March AFB, leaving behind its P-80Bs for the 57th FG based at Elmendorf AFB near Anchorage.

On November 17, 1948, Charles Lindbergh, then Special Assistant to the Chief of Staff USAF, visited Alaska to inspect Ladd, view the territory's air defence capabilities and pay a visit to the 4th FG, equipped with the (redesignated) F-80B and newly arrived from Andrews AFB in Maryland for cold-weather testing.

Roy Ihde, who was then serving with the 4th FG,

recalls meeting the great aviation pioneer at Ladd:

"I was cold-weather testing the F-80 fuel system out of Ladd Field at Fairbanks; I was there for just a short tour of duty. Lindbergh was on the Air Force Advisory Committee and he was looking into the facilities in Alaska, in case war broke out and we'd be fighting the Russians up there.

"He joined the squadron for two weeks and flew with us. The Ops Officer had me sit down and go through the flight manual with him. [The Ops Officer] said 'You sit down with Colonel Lindbergh, go through the flight manual with him, explain the different features of the aircraft; how to start it, how to shut it down, how to use the purging system'. We had to purge the engine with gasoline. We would run the jet engine on







**LEFT** An Arctic air warrior squeezes himself into the already-cramped cockpit of an F-80B. With the pilot bundled up for warmth, movement was severely restricted once he had strapped in, and the prospect of trying to extricate himself in case of an in-flight emergency would have been extremely daunting. Former 4th FG pilot Roy Ihde, who flew the F-80 at Ladd in 1948, later recalled that the risk was worth it: "It was fun. I loved it. I loved the speed — 550 m.p.h. [885km/h] was real easy for an F-80. It was just like sitting in the nose of a bullet . . ."

gasoline before shutting it off, so that it would have gasoline in the system and be easier to start.

"In the conditions we were flying in — it was -43°F [-42°C] on one day — the kerosene would be so stiff it was like syrup, and you may not get a successful start if it was saturated with cold. So using gasoline in the shutdown procedure would assure a decent start the next time."

Ihde remembers operations from Ladd during his short tenure there:

"The aircraft would be brought out of the hangar, we would start up and taxi out; by the time we got to the runway for take-off, long strands of hoar-frost would be forming on the wings. We'd have a crew chief take a wing cover, run it up and down the wing until the frost was gone, then take off before it formed again.

"It was so cold you could take a rubber hose from the fuel system and pound a nail into the ground with it — it was that cold." The conditions were far from comfortable, but the flying did have benefits of its own, as Roy explains:

"There were only about four hours of daylight when we were there. We would take off at 1300hr, and they were just starting to turn the lights on; by about two o'clock it would be dark already up there. We flew over the Arctic Circle and Fort Yukon. When I got down from one mission, one of the pilots said, 'Roy, as far as we know this is the first massed jet formation ever to fly over the Arctic Circle'. There were 16 of us that day; four flights of four, each flight in 'fingertip' formation.

"On one occasion I went out to the gunnery range and fired my 0.50in machine-guns. Right beside the gunnery range I saw a bull moose and a moose cow — I could have kicked the rudder right just a bit and machine-gunned them, but I didn't. I had respect for the wildlife up there.

"On another occasion I took off and saw the caribou migrating — there must have been 1,500

of them heading for their grazing grounds. They were stampeding and I went over their heads quite low. They were running before I got there; they were looking up at me as I went over. They were just doing their thing. They do it every year. That is some beautiful country up there."

Upgraded winterised F-80Cs were flown to Alaska and delivered to the 57th FG at Elmendorf in 1948, which divided them between the 64th and 66th Fighter Squadrons (FS), constituting the jet fighter portion of Alaska's air defences, sharing the mission with the North American F-82 Twin Mustangs of the 449th FS and several squadrons of the same company's F-51H Mustangs. The Alaska-based F-80s were equipped with jet-assisted take-off (JATO) bottles and during one Elmendorf AFB Open House, an F-80 departed using JATO equipment, thrilling Alaska's citizens.

#### OPERATIONAL BLOWTORCHES

From 1948 the F-80s became operational and were frequently scrambled to identify aircraft detected on radar which had not identified themselves via radio. None were Soviet aircraft penetrating Alaska's landmass, although native Alaskans living in their villages in the far north-west reported spotting unidentified aircraft flying parallel to the Alaskan coastline.

During the spring of 1948 Alaska's radar-warning network was tested when two ELINT B-29s departed Ladd Field in radio silence. Radar units at Galena AFB, Marks AFB near Nome, and Elmendorf AFB detected the aircraft at different times. One 57th FG F-80 detected and intercepted the B-29s and was quickly joined by four more F-80s, the jets making nine separate "attacks" on the bombers in just 12min. All Alaska-based F-80s reported as "guns-hot" at all times. The bombers shut down their electronic countermeasures (ECM) equipment and returned to Ladd.



JACK ZIMMERMAN VIA AUTHOR

**ABOVE** Renowned helicopter pilot Jack Zimmerman (who plays a major part in Cessna's Whirlybirds in TAH3) stands on the wing of what may be F-80C 49-429, having landed nearby in his Alaska Airlines Bell 47B. It was '429 that made a forced landing on the Alaskan tundra in May 1950 and which was later fitted with skis and flown out.



USAF VIA AUTHOR

**ABOVE** A 94th FS pilot demonstrates the standard flying-kit for sub-zero operations. On his back is a full survival pack, beneath which is his parachute pack. The research performed at Ladd Field was not only about aircraft operations; clothing and survival equipment was also extensively tested at the base.

For decades Alaska's inclement weather has added to the hundreds of wrecks dotting the local landscape, and the F-80s were no exception. In January 1951, 64th FS F-80C 47-585 was being flown by Lt Donald C. Seiler when the pilot had to make a forced landing on Goose Bay flats across Knik Arm. Within 5min a 10th Air Rescue Sqn (ARS) Sikorsky H-5 had dropped food and a sleeping bag to the uninjured pilot. Within 12min, however, Seiler had been picked up and was on his way back to Elmendorf. A month later, 64th FS pilot Virgil Miller was killed when his F-80C-5, 47-595, crashed into the mud flats of Turnigan Arm near Potter, exploding on impact.

### SHOOTING STAR ON SKIS

An unusual F-80 story began on May 24, 1950, when F-80C 49-429 of the 66th FS suffered an engine flame-out, forcing the pilot, Nolan Dotz, to belly-land on the marshy tundra near Willow, Alaska. A 10th ARS H-5 landed to retrieve the pilot, radio and other items but a reclamation crew was forced to wait for the onset of the 1950-51 winter season, when the tundra would freeze.

Fighting 15ft (4.5m)-high snowdrifts, the crew reached the aircraft by dogsled and cleared a dropzone near the F-80 for supplies to be parachuted in. The winter repairs were slowly accomplished from a hastily built woodshed in which were stored parts, tools and a Herman-Nelson heater to keep the men warm.

The wing tanks were removed and the F-80 was jacked up and supported on temporary timber





**ABOVE** Although conclusive proof has yet to be found, it has been stated that F-80C 49-580 was the pattern aircraft for the skis constructed and fitted to the downed 49-429, or that it may have been extracted from the tundra using the same method; although, given the pristine condition of the skis, the latter seems less likely.

cribbing to prevent it freezing solid to the tundra.

During the second winter a crew, with assistance from Lockheed technical representative John B. Clark, finished sheet-metal and electrical-wiring repairs and performed an engine change. At the same time a 2,500ft (760m) makeshift runway was slowly cleared over the tundra.

The crew then set about custom-building a trio of metal skis with bungee cords to prevent them from snagging the ground. Extra thrust would be necessary for a take-off attempt, so two JATO bottles providing an additional 4,000lb of thrust would be installed; the two-year project was now given the name Operation *Jet-JATO-Ski*. The pilot who would make the take-off from the ice was World War Two ace Lt-Col William P. Benedict, Assistant Deputy Chief of Staff, Operations for Alaskan Air Command, who volunteered to fly the F-80 off the tundra — minus the canopy.

After a heavy snowfall the reclamation crew and pilot landed by helicopter and readied it for take-off by installing the skis and JATO bottles. When all the checklists were complete Benedict started the engine and quickly ignited the JATO bottles, forcing the F-80 to plough through deep snow and bounce its way over the frozen tundra hummocks. The converted F-80 finally became airborne. Benedict flew over the camp, dipped his wings and safely landed at Elmendorf AFB shortly thereafter. The reclamation project reportedly saved \$1,000,000 of the taxpayer's money and the F-80 was soon returned to service.

Throughout the 1950s Ladd Field continued

to be a busy, thriving military base, supporting Aircraft Control & Warning (AC&W) sites and the north-western segments of the Distant Early Warning Line (DEW Line), as well as becoming a centre for Arctic research. Air defence remained Ladd's principal activity until 1958, when a combination of changing technology — the advent of intercontinental ballistic missiles and satellites — and budget constraints forced the military planners to reassess their resources. Defence spending was radically cut towards the end of Dwight D. Eisenhower's presidency, and in September 1959 USAF HQ announced to Alaskan Air Command that Ladd Field would be closed, its duties being absorbed into the other bases at Eielson and Elmendorf.

#### LADD BECOMES FORT WAINWRIGHT

In August 1960 the 449th Fighter-Interceptor Squadron, then flying Northrop F-89 Scorpions from Ladd, was disbanded, with all flying ceasing at the base the following month. Already the HQ of the US Army's Yukon Command, Ladd became home to 2,000 Army personnel at the end of 1960 and on January 1, 1961, the Army formally took over the base and renamed it Fort Wainwright.

The site was declared a National Historic Landmark in 1985, largely in tribute to the sterling work which had been undertaken by the determined, hardy souls that had made invaluable contributions to military aircraft operations during cold-weather testing at the base since 1940.





# ARMCHAIR AVIATION

**We take a look at what's available for the aviation history enthusiast in the world of books and other literature, from hot-off-the-press publications to reissued classics**

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## ***To Rule The Winds: The Evolution of the British Fighter Force Through Two World Wars Volume 1: Prelude to Air War — The Years to 1914***

By Michael C. Fox; Helion & Co Ltd, 26 Willow Road, Solihull, West Midlands B91 1UE; 6½in x 9½in (165mm x 241mm); hardback; 314 pages, illustrated; £34.95. ISBN 978-1-909384-14-9

FROM THE PRODUCTION point of view this is a disappointing book. It is perfect-bound and has very poor artwork on the jacket, and most of the pictures inside look more like photocopies than proper reproductions, many having been taken directly from old magazines and being flat and dark. Whoever Farr out Publications are (they designed the book for publishers Helion), this work certainly does them no credit.

The content is both absorbing and frustrating. The author has made extensive use of countless files in The National Archives, presenting readers with many interesting arguments and debates about the future employment of military aircraft. These are linked by a narrative interpreting the official documents and tracing aeronautical developments in the early years, and it is here that problems arise. While the author has put his trust in some books I would have treated with caution, he seems to have missed other, more important titles, completely. There are conspicuous omissions and errors. For example, nowhere is the reader informed of the very demanding specification presented to "Cody" (his real name, Cowdery, is never revealed) when he set out to build British Army Aeroplane No 1, the true story behind the S.E.1 and the tragic and unnecessary death of Lt Theodore Ridge is not told, and it is not made clear that the B.S.1/S.E.2 and S.E.4 were designed from the outset as unarmed high-speed scouts, as related in Issues Nos 3 and 5 of this journal. Moreover, having been told on page 203 that "only one example of the S.E.4 was built", we

are told on page 204 that "a second S.E.4 type crashed in October 1914", although reputable historians have recorded that the second machine was never completed. The Antoinette engine used in BAA No 1 did not come from the *Nulli Secundus* airship, and it has been shown that Richard Pearse did not attempt to fly until 1909 [as covered by Errol Martyn in *TAH7 — Ed*]. In one instance the Aeronautical Society becomes the Aviation Society. On page 20 Maxim is seen with the propeller of his 1910 biplane, not his 1894 test rig, and the "Avro 504" on page 211 is an Avro Type 500. While the nascence of the RFC Military Wing is covered, the early years of the Naval Wing and the Royal Naval Air Service are virtually ignored. There is nothing about the fact that early naval aviation owed its initial impetus to the generosity of a wealthy civilian, Francis McClean, whose name is entirely absent from this book.

On the plus side, there are informative sections on early experiments with airborne machine-guns and wireless telegraphy. Just how many volumes will comprise the complete account of British fighter evolution is unclear, but more care needs to be taken if the story is to be recorded accurately.

**PHILIP JARRETT**

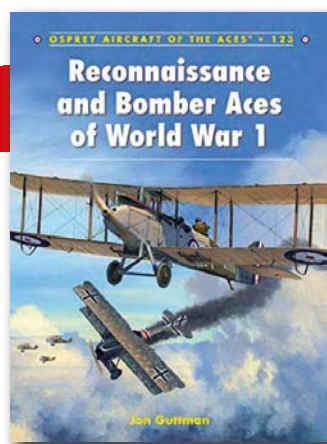
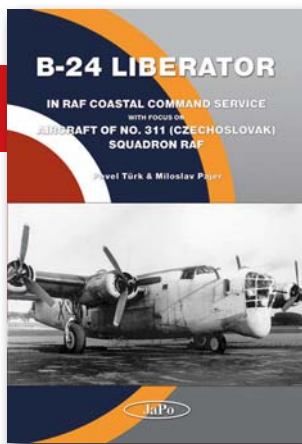
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## ***B-24 Liberator in RAF Coastal Command Service with focus on Aircraft of No 311 (Czechoslovak) Squadron RAF***

By Pavel Türk and Miloslav Pajer; JaPo Publishing, Hradec Králové, Czech Republic; available from The Aviation Bookshop, 31–33 Vale Road, Royal Tunbridge Wells, Kent TN11 1BS ([www.aviation-bookshop.com](http://www.aviation-bookshop.com)); 8½in x 12in (216mm x 305mm); 320 pages, illustrated; hardback; £59.99. No ISBN

ALTHOUGH PERHAPS overshadowed by Boeing's more glamorous B-17 Flying Fortress, the Consolidated B-24 went on to become the





most-produced bomber aircraft in history. The name "Liberator" was first assigned to the type by the RAF and was subsequently adopted by the USAAF. Approximately 40 per cent of Liberators delivered to the RAF were allocated for maritime service. It is fitting, then, that this book deals with the B-17's ugly sister in service with the Cinderella of the RAF, Coastal Command.

In his foreword, Sqn Ldr T.M. Bulloch DSO\* DFC\* recalls the experience of 17-hour flights in a largely unheated aircraft and it is grimly ironic that the Liberators used to close the Atlantic Gap in the U-Boat war were, almost invariably, deathtraps for their own crews in the event of ditching in the sea.

The book commences with an overview of the history of Coastal Command from its inception as "Coastal Area" in 1919 to its renaming as Coastal Command in 1936, on to its disbandment in 1969 when it was incorporated into Strike Command. This is followed by a chapter describing the RAF's Liberators, including details of the aircraft produced, versions and variants, airframe differences and serial numbers. We then move on to individual histories of the 13 Coastal Command squadrons that operated the B-24, which included two Operational Training Units (OTUs) and one Heavy Conversion Unit (HCU).

The next section is the largest part of the book and details each of the 81 Liberators allotted to No 311 (Czechoslovak) Sqn. Manufacturer, serial number, sub-type, operational history; it's all here with as much information as would satisfy even the most demanding rivet-counter. This is backed up with detailed and interesting appendices, hundreds of excellently reproduced photographs and 70 high-quality colour profiles.

One of the authors, Pavel Türk, is widely regarded as a leading expert on the B-24 and, in collaboration with Miloslav Pajer, has produced the most comprehensive book on the subject this reviewer has seen to date. The lengthy bibliography is testimony to the detailed research the pair have undertaken. This book is a "must-have"

for all B-24 buffs, as well as those who are interested in Coastal Command and the service of Czechoslovak aircrew during World War Two. It is also an excellent reference for scale modellers.

Ivan Schwarz and Arnost Polak, former Liberator aircrew who served with No 311 Sqn, were signing copies at a recent book launch. You can't get a better endorsement of this authoritative work than the obvious approval shown by these Coastal Command veterans.

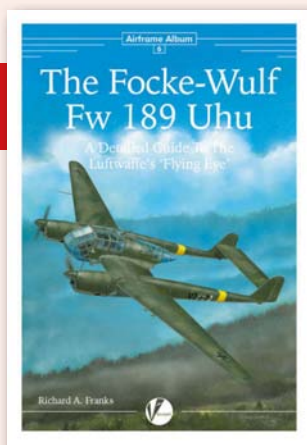
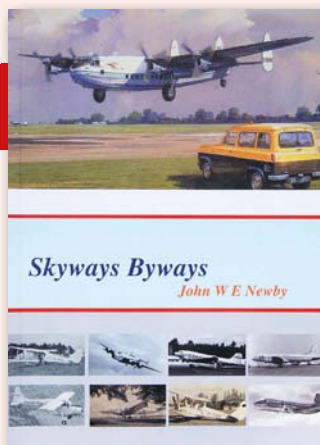
**GARY BARTLETT**

## ***Reconnaissance and Bomber Aces of World War 1***

*By Jon Guttman; Osprey Publishing, Midland House, West Way, Botley, Oxford OX2 0PH; 7¼in x 9¼in (186mm x 248mm); softback; 96 pages, illustrated; £13.99 + p&p. ISBN 978-1-78200-801-9*

ONE OF THE more unusual titles in Osprey's *Aircraft of the Aces* series, this new book by World War One aviation specialist Jon Guttman showcases a different group of aces and their aircraft. We tend to think of air aces flying sleek single-seat types alone in the sky against an enemy fighter. But there were quite a few aces flying multi-seat aircraft. Often the pilot and his observer/gunner shared credit for kills, and just as often the gunner or pilot shot down opposing aircraft by themselves.

Besides the many unusual photographs, and the excellent cover illustration by Mark Postlethwaite GAvA, the book features a folio of colour profiles by renowned artist Harry Dempsey, which offers a very satisfying line-up of aircraft rarely — if ever — seen in such detailed display. Early war Caudrons, Sopwith 1½-Strutters, Breguet and Salmson bombers — along with German Rolands, Albatros and Hannovers — are depicted in their wartime colours. Of particular interest is one small



marking on the first profile, a French Caudron G.4, on the crew nacelle of which is an appealing little geometric design, a red "cocotte", which looks something like a piece of origami. It was indeed a bird made of folded paper, the insignia being that of pilot Capt Joseph Vuillemin, who eventually brought his score to seven.

At the beginning of the First World War, *escadrilles* had no badges. They started to design them in late 1915 and early 1916. The famous Escadrille 11 started as C.11 (C for Caudron). The cocotte was chosen in July 1916 by Capt Vuillemin who, after the war, adorned all his aircraft with the red paper bird. He later became Chief of the *Armée de l'Air* during 1939–40. He had quite a personal history that is well worth researching. After the Second World War the cocotte was used on the aircraft of one escadrille of the 33ème Escadre de Reconnaissance.

With this book Jon Guttman has opened up an entirely new and rarely discussed area of First world War aviation. His new book should please the historian and modeller alike.

PETER B. MERSKY

## Skyways Byways

By John W. E. Newby; self-published (available from [newby554@btinternet.com](mailto:newby554@btinternet.com)); 9in x 12in (229mm x 305mm); hardback; 268 pages, illustrated; £39.99 + £3 p&p; ISBN 978-0-95717-851-9.

SKYWAYS WAS FORMED in 1946 as an independent airline with its principal activities being non-scheduled services including trooping and oil industry support flights and specialist freight services. It was one of the major civilian participants in the Berlin Airlift, but its fortunes quickly faded and it went into liquidation in 1950. Two years later its assets, including the name "Skyways" were transferred to the Lancaster Aircraft Corporation (LAC), the

managing director of which was Eric Rylands. He is not as well known as Freddie Laker or Harold Bamberg, but his part in the growth of independent airlines in the 1950s and 1960s was noteworthy. Skyways became at one time the largest operator of non-scheduled services in Europe. Finally in 1962 it was absorbed into Euravia, which in time became Britannia Airways and ultimately part of Thomson.

A history of Skyways has been long overdue and it is fitting that this has now appeared under the authorship of John W.E. Newby, who worked for both LAC and Skyways in a number of positions. His affection for the company is apparent, and he has selected many personal recollections by former colleagues, which confirm that there was an informal, friendly atmosphere among the staff, who also took great pride in what they did. One anecdote describes how the captain of a Hermes suffering from a stuck nosewheel arranged for a number of "weighty looking soldiers" to take position in the forward cabin and, when signalled after landing, rush to the rear of the aircraft thus enabling balance to be maintained until the speed had reduced to 30 m.p.h., when the nose dropped gently with little damage resulting. Typically, Rylands sent a personal appreciation to the captain for his quick thinking.

The book has a slightly unusual format, resembling a personal scrapbook containing copious different memories. Images are not gathered together in sections but are mainly set into the margins on both sides of the page. This means that they are smaller than full-page renditions but the benefit is that many more unique photos can be included. Some images, including contemporary adverts, do receive full-page reproduction.

There are charts depicting such information as the service periods of each aircraft, and reproductions of internal documents such as Flying Staff Instructions, Route Specifications, Operations Log Extracts and Flight Safety Reports. Such documents would not be seen by





# Cross & Cockade International

Edited by Mick Davis; *Cross and Cockade International*, Hamilton House, Wadenhoe, Peterborough PE8 5ST; 11¼in x 8¼in (297mm x 210mm); softback; 76 pages, illustrated; £27 (annual UK subscription covering four issues). ISSN 1360-9009. Website [www.crossandcockade.com](http://www.crossandcockade.com)

AN ABSOLUTE must-read for serious devotees of World War One aviation history, *C&C Journal* is a long-established and high-quality beacon of aeronautical publishing which, like *TAH*, aims to bridge the gap between newsstand and academic periodicals. The Spring 2015 issue (Vol 46 No 1) includes features on, among other subjects, high-altitude recce in 1914; RFC officer fatalities on the first day of the Battle of Flers-Courcellette on the Somme; an album of rare photographs of German and captured British aircraft; kite-balloons at Gallipoli and Salonika; and a biography of prickly Canadian RNAS fighter ace Capt C.R.R. Hickey DFC.

Regular sections include a gazetteer of flying sites in the British Isles, accompanied by loose-inserted annotated Ordnance Survey maps; a listing of individual aircraft details; queries and feedback; and three pages of medium-length book reviews. Printed on glossy paper throughout, with heavier varnished covers, the journal is weighty, satisfying and excellent value. Good reproduction of black-and-white photographs in the body of the magazine is complemented by colour illustrations on the covers, where four-colour scanning of black-and-white images adds extra depth and a hint of sepia tint. The design is simple, clean and unambitious — throughout, the content is king. **MICK OAKEY**

passengers and their inclusion gives a special atmospheric flavour of what it must have been like to be involved in independent civil aviation in the days of Avro Yorks, Handley Page Hermes and Lockheed Constellations. Two sections have been included which give rather basic aerodynamic information. These are superfluous, as any enthusiast reading the book would already be cognisant of such matters, and they are rather formal in contrast with the overall feel of the contents.

The book evokes strong nostalgia for an age when passengers and staff were treated as individuals. John Newby is to be congratulated for recreating those times with such clarity.

**FRED CROSSKEY**

## Airframe Album No 6: The Focke-Wulf Fw 189 Uhu

By Richard A. Franks; *Valiant Wings Publishing*, 8 West Grove, Bedford MK40 4BT; 11¼ x 8¼in (297 x 210mm); softback; 132 pages, illustrated; £16.95. ISBN 978-0-95758-668-0

I POUNCED EAGERLY on this new volume; not least because I go back quite a long way with the Fw 189 as a type — having, in 1992, during my previous life on *Aeroplane*, broken the news of the discovery of the sole substantially-intact surviving example *Werknr* 2100 V7+1H, and its recovery from the former Soviet Union to the UK by leading warbird finder Jim Pearce. And long before that, of course, like many *TAH* readers of a certain age, I built the Airfix kit; something of a rite of passage.

Just like the Bristol Blenheim book from the same publisher, reviewed in *TAH11*, this volume is designed to appeal primarily to modellers, but to include plenty of detailed information to attract the general enthusiast as well. Subtitled *A Detailed*

*Guide to the Luftwaffe's "Flying Eye"*, the publication is divided into four main sections — in this case *Technical Description*, *Evolution*, *Camouflage & Markings* and *Models*.

Following a few pages of type-history, the first section examines the airframe, engines and equipment in seemingly forensic detail through the use of generally excellent black-and-white photographs allied with crisp line drawings culled from servicing manuals. The equipment information includes the reconnaissance cameras essential to the aircraft's role, and even the sequence/overlap controller which was used to create the classic photo-recce mosaic of images of the target area.

In the *Evolution* section, no fewer than 42 three-quarter perspective drawings of the aircraft, all from the same viewpoint, clearly show the differences between the many variants — the prototypes, the main reconnaissance models, the nightfighters, the trainers, the armoured ground-attack versions, and the unbuilt floatplane trainer (no, me neither).

The *Camouflage & Markings* section features a variety of prototype and Luftwaffe camouflage schemes, as well as foreign and captured examples, illustrated with photographs and excellent colour side- and partial-plan-view artworks by Richard Caruana.

Finally, the *Models* section features kit-builds and upgrades — including a fine ½nd-scale Condor kit made up by Libor Jekl in the well-worn winter snow-wash camouflage of my old friend V7+1H. Aah! Uhu!

The back cover features a full Caruana artwork of 1H's sister aircraft V7+1J, complete with the stork insignia of 1.(H)/ *Aufklärungsgruppe* 32 on the side of the crew nacelle. As with the Blenheim book, the only possible enhancement I can envisage would be the inclusion of a set of scale drawings, to satisfy flying scale scratchbuilders as well as kit modellers. Overall, it earns twin booms of approval from me.

**MICK OAKEY**



# BOOKS IN BRIEF

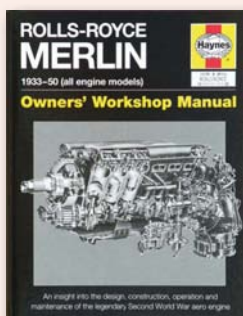
A quick round-up of what else is currently available for the aviation history enthusiast

## ROLLS-ROYCE MERLIN (1933–50) OWNERS' WORKSHOP MANUAL

Ian Craighead

J.H. Haynes & Co Ltd;  
ISBN 978-0-85733-758-0;  
RRP £25

IT'S PRETTY RARE to see books about aero-engines these days — most publishers put the subject into the “too difficult” box — so to see an authoritative but accessible volume like this is refreshing. It follows the popular Haynes Manual style, albeit the first 83 pages are mostly history rather than technical detail; but there is a good “Anatomy of the Merlin” chapter (with plenty of diagrams from Air Publications), plus perspectives from pilot, engineer and restorer. The author is Rolls-Royce's Head of Corporate Heritage, and also CEO of the Rolls-Royce Heritage Trust. **MO**

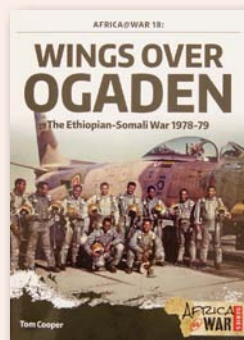


## WINGS OVER OGADEN: THE ETHIOPIAN-SOMALI WAR 1978–79

Tom Cooper

Helion & Company Ltd; ISBN 978-1-90998-238-3; RRP £16.95

THIS, THE 18th in the indispensable *Africa @ War* series from Helion, focuses on the intriguing, little-known late-1970s conflict between Ethiopia and Somalia, during which the Soviet Union switched from supplying aid to Somalia to supporting Ethiopia, which was originally backed by the USA — which as a result switched its backing to Somalia. *TAH* contributor Tom Cooper does his customary job of digging deep into the archives to provide another exemplary book on an obscure but fascinating chapter in the history of air warfare. **NS**

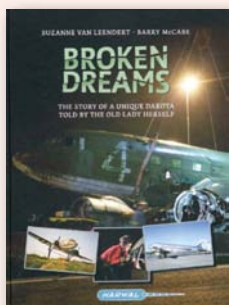


## BROKEN DREAMS

Suzanne van Leendert & Barry McCabe

Narwal Publishers; ISBN 978-9-08171-105-0; 45

THIS QUIRKY BOOK is an “autobiography” of Douglas DC-3/C-47 F-BAIF, written from the viewpoint of the aircraft itself. Built for the USAAF in 1944, the Dak served with the *Armée de l'Air* and in 1945 went on to the French civil register. After passenger- and mail-carrying with Air France during 1946–69, it had a chequered career in the 1970s, flying chickens to Casablanca and undertaking geophysical research. Preserved on a pole in Belgium for 15 years, it came to a sad end in 2010 while being road-transported to Valkenburg for use in a musical (yes, quite); the cockpit and other parts survive. There is also a DVD of the same name, and a website at <http://www.brokendreams.eu>. **MO**

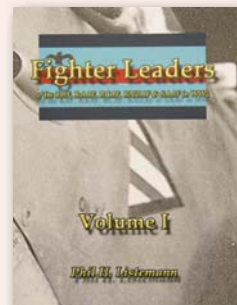


## FIGHTER LEADERS OF THE RAF, RAAF, RCAF, RNZAF & SAAF IN WW2 Volume 1

Phil H. Listemann

Philedition; ISBN 978-2-91859-050-7; RRP £12.95 (paperback), £7.19 (e-book via Amazon UK)

CLEARLY A LABOUR of love, and somewhat rough around the edges, this slim volume, available in both print and digital formats, details the careers of a selected group of British and Commonwealth officers who distinguished themselves during wartime flying service. The (rather too) potted biographies, presented in alphabetical order by surname, offer the basics of these airmen's combat careers and the various awards and decorations they accrued, and are accompanied by photographs of the men and their machines. **NS**

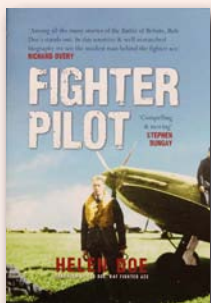


## FIGHTER PILOT

Helen Doe

Amberley Publishing; ISBN 978-1-44564-611-4; RRP £25

BOB DOE achieved 14 aerial victories during the Battle of Britain and went on to serve with distinction in the Burma Campaign. Here his daughter, a renowned professional historian, expands on the life related by Doe himself in his 1921 autobiography. Despite the (edited-in?) misnomers — “Gloucester” rather than Gloster Gamecock for example — this is, unsurprisingly, a cut above the usual combat pilot hagiography. **NS**



## DRAGON LADY TODAY: THE CONTINUING STORY OF THE U-2 SPYPLANE

Chris Pocock

Self-published; ISBN 978-1-50096-546-4; RRP £15 (via Amazon UK)

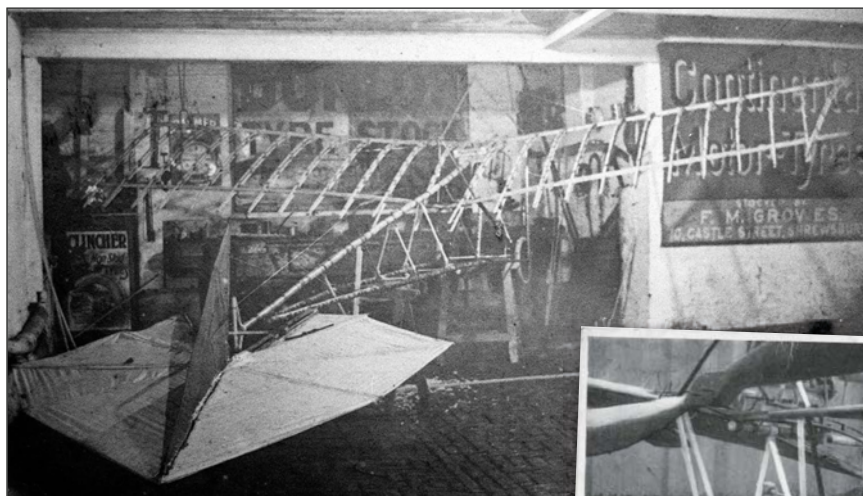
IN 2005 BRITISH author Chris Pocock published his definitive 440-page *50 Years of the U-2* for Schiffer, cementing his reputation as the world's leading authority on what he describes as “the aeroplane that just won't go away”. Now celebrating its 60th anniversary, the “Dragon Lady” looks set to continue its career at least until 2020, and this self-published softback brings the story fully up to date. **NS**





# Lost & Found

**PHILIP JARRETT** explores the lesser-known corners of aviation history, discovering unknown images and rediscovering long-lost details of aircraft, people and events. This time he takes a look at one of the long-lost pioneers of aviation in Shropshire . . .



**LEFT** The monoplane nearing completion in the factory, clearly showing the all-moving cruciform tail surfaces.

**BELOW A contemporary postcard of William Groves in his Demoiselle-type monoplane at his father's garage in Shrewsbury.**



**P**HOTOGRAPHS OF hitherto “unknown” pioneer aeroplanes built in Britain continue to surface. In 1995 Toby Neal of the *Shropshire Star* newspaper published a piece about a local lad, William F. “Willie” Groves, who, at the age of 17, had built his own version of Brazilian pioneer Alberto Santos-Dumont’s diminutive Demoiselle monoplane. Willie’s father, Frederick Matthew Groves, had apparently owned the first car in Shrewsbury, and he ran a garage in St Mary’s Place, at the back of the Crown Hotel, Shrewsbury, where he repaired automobiles and manufactured bicycles in his appropriately named Crown Works.

In 1910 Willie built the wood-and-fabric aeroplane in the works. He then made a brief hop in it, probably in the summer of that year, in one of the nearest suitable fields around the town. The make and horsepower of the engine is not known, but it appears to have been an air-cooled four-cylinder in-line unit, probably an automobile engine.

Neal says that Groves was probably Shrewsbury’s “first ever aviator”, having accomplished this around a year before the previously known earliest aeroplane flight in Shropshire. When Toby Neal interviewed Willie’s daughter, Mrs Dorothy Chidlow of Uffington, she still had the second propeller made for the machine (the first proved too heavy), but she had no idea of how far the

aircraft flew. She said that her father “was not a man who talked a lot”, and always declined to answer her enquiries about his aeroplane, although he said it did leave the ground. One suspects it did little more. How the aviator operated the controls is not clear, but Groves seems to be holding a horizontal bar; exactly what it did is uncertain. The all-moving cruciform tail surfaces were attached to the triangulated fuselage longerons by a universal joint, but there does not seem to be any form of lateral control, such as wing-warping.

As early as January 16, 1910, Willie wrote to the Aero Club of the United Kingdom regarding the possibility of displaying his creation at the Olympia Aero Show in March of that year. Unfortunately he had spent all his money on building the monoplane and could not afford to take it to London. In June he subscribed to membership of the Midland Aero Club, which cost him half a guinea. He later took over his father’s automobile repair business. Willie served in the Royal Flying Corps in the First World War, but not in a flying role.



# Echoes from Dawn Skies

## A Lost Manuscript Rediscovered

**THE STORY SO FAR:** Shortly before his death in 1956, aged 76, renowned pioneer pilot and flying instructor F.W. Merriam — who in 1912 was the first man to fly an aeroplane through cloud — completed a book manuscript, entitled *Echoes From Dawn Skies*. It comprised recollections of the early years of flying, gathered from his contemporaries, many of whom had by then become leading figures in the aviation world.

Seeking “to present a more personal and intimate picture than has yet been produced”, Merriam had asked them each to “contribute a story of a personal nature, something that had never before been published”.

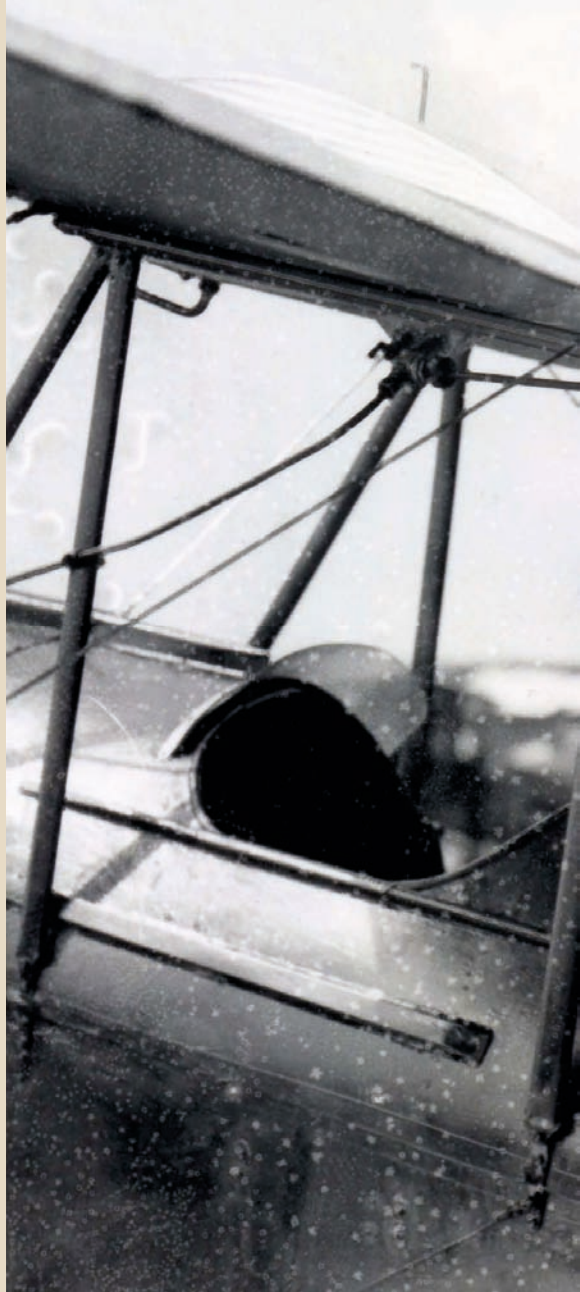
The result was a treasure-trove of fresh, first-hand insights into the lives, the work, the unquenchable spirit and the humour of these early flyers. Sadly Merriam died before the book could be published, and the priceless manuscript vanished into obscurity for more than half a century . . . until, in the summer of 2013, it came to the attention of *The Aviation Historian*. Merriam’s granddaughter, Sylvia Macintosh, aware of the manuscript’s importance and keen to see it finally in print, discovered *TAH* and got in touch with Managing Editor Mick Oakey, who immediately set the wheels in motion. As Mick says, “Reading the material today is the next best thing to teleporting back in time and sharing a pint or a convivial dinner with these remarkable men”.

Merriam prefaced the 25th chapter of *Echoes From Dawn Skies* with the following preamble:

“One of my keenest flying pupils in 1913 was Frank Halford. So keen was he on flying that after taking his ‘ticket’ [Royal Aero Club Certificate No 369] he stayed on as my assistant instructor at the Bristol School. I was glad because I was working single-handed at the time. However, it was not long before he realised his special passion was for engine design and he left me to go to the Royal Aircraft Factory at Farnborough.

“With the exception of that great jet genius, Sir Frank Whittle, Major Halford is, in my opinion, England’s number one aero-engine expert. Like the Gnome engine for the success of early flying, so were Halford’s Cirrus and de Havilland Gipsy engines installed in Moths and other lightplanes between the two World Wars, giving aviation the wonderful ‘facelift’ she so badly needed — reliability! Typically, Halford has chosen to record here an episode in the life of one of his famous prodigies . . .”

In the seventh part of our exclusive serialisation of **FREDERICK WARREN MERRIAM’s** unpublished volume of collected early-aviation memories, *Echoes from Dawn Skies*, British engine pioneer Frank Halford recalls the small but important part he played in his protégée Amy Johnson’s record-setting flight to Cape Town in a de Havilland Puss Moth in November 1932





# HALFORD SAVES ♦♦ THE DAY ♦♦♦♦

MAJOR FRANK BERNARD HALFORD CBE FRAeS (1894–1955)



**"M**ANY, MANY YEARS ago, long-distance record-breaking in light aeroplanes was quite the vogue, and most people will have heard of Amy Mollison [née Johnson] in that connection. Amy generally used a de Havilland Moth for her flights and the Gipsy engine was my particular concern. Experience had shown that such solo flights were particularly exhausting and it was wise to assume that the pilot had more than enough to do in flying and navigating for days on end without being called upon to work on the engine or airframe. What was needed, therefore, was an engine requiring no attention whatsoever.

One day Amy decided to try and break the London—Cape Town record in a Puss Moth, using the West Africa coast route. Whilst preparing her engine for the attempt we realised that the only engine component which might need attention was the felt-type oil filter,

**ABOVE LEFT** *Frank Halford at Hatfield during the development of the D.H.106 Comet, when he was Chairman and Technical Director of the de Havilland Engine Co. BELOW Amy Johnson prepares to leave the de Havilland factory at Stag Lane in a D.H.60 Moth, to fly to her home town of Hull in August 1930.*

PHILIP JARRETT COLLECTION x 2





## HALFORD: "OUR ENGINE GENIUS"

BORN IN NOTTINGHAM on March 7, 1894, Frank Halford left the University of Nottingham before graduating to learn to fly at Brooklands in 1913. On the outbreak of the First World War Halford (seen in 1915, ABOVE) joined the RFC. Engines were always Halford's passion and by 1916 he had become the "H" in the BHP engine later developed into the Siddeley-Deasy Puma. In 1923 Halford established his own engine-design consultancy, creating the Cirrus, Nimbus and ubiquitous Gipsy series of engines. The prolific engine genius went on to design the Rapier, Dagger and Sabre for Napier and the Goblin, Ghost and Gyron jet engines for de Havilland before his death in 1955.

which might clog and cause the oil pressure to drop if not cleaned or replaced. Before the attempt, I advised her to forget about the engine altogether, but when stopping for fuel about halfway she should have the oil filter cleaned.

On the day of the attempt everything went beautifully according to schedule. By the time Amy was halfway to Cape Town she had plenty of time in hand over the previous record.

I was walking down Piccadilly in London when I saw a newspaper placard saying 'Amy Mollison Retires'. I bought a paper and, in the Stop Press, read: 'Amy Mollison retires due to no oil pressure'. I thought at once it could only have been owing to oil-filter trouble. That alone could have brought about a drop in oil pressure. I telephoned Jim Mollison and he had already received a cable, from a rail stop on the West African coast, saying 'low oil pressure'. The suspected cause was confirmed and in a few minutes a cable was despatched saying 'Throw away oil filter and carry on'.

My joy can be imagined when seven hours later it was announced that Amy had continued her flight still with time in hand. The next day we all heard of her safe arrival in Cape Town with six hours knocked off the previous record.

On her return to England Amy told me that she was so tired when she reached halfway that the advice given her about the filter quite slipped her memory for the moment. When a little African boy came rushing to her with the

**BELOW** *The D.H.80A Puss Moth, G-ACAB, named The Desert Cloud, used for the Cape Town flight, on display in Lewis's Store in Leeds in February 1933.*

PHILIP JARRETT COLLECTION x 2







PHILIP JARRETT COLLECTION x 2

**ABOVE** A contemporary postcard showing Johnson's return to the UK. She had beaten the record set by her husband, Jim Mollison (they married in July 1932), having made the flight from Lympne to Cape Town in four days, 6hr and 54min, arriving in South Africa on November 18, 1932. The oil-filter trouble had been at Benguela, Angola.

cable she realised in a flash what had happened. Within half an hour she had thrown the filter away, refuelled and taken off for Cape Town and a new record."

## POSTSCRIPT

Following Halford's brief recollection, Merriam continued:

"The late Amy Johnson was a woman of great courage and endurance and a clever licenced ground-engineer. I saw her last in overalls, busily attending to her 'plane, not long before her lamentable end over the Thames Estuary in foggy conditions in 1941.

She married Jim Mollison MBE FRGS AFRAeS, another conspicuous flyer. The late Bert Hinkler, holder of several long-distance records also lost his life in fog, flying into a mountain in Italy. These two did much to popularise the lightplane clubs, and have reasons to be grateful to Halford for much of their success, as he made it possible with his reliable engines.

"When Halford left me to go to the Royal Aircraft Factory at Farnborough, he came

under that great authority on Engineering Mervyn O'Gorman (**INSET BELOW**), who was superintendent there. Besides being one of the brains in this sphere, his history shows a very full record from the earliest days in aeronautical developments. I felt sure that an anecdote from so great a store of recollections would be tremendously worthwhile, so I wrote

to him. There was no reply, so I wrote a second time, and still there was no reply. Refusing to be beaten, I made another attempt, but extracted only a disappointing answer to my request.

"O'Gorman wrote, 'I do not feel that my very simple existence is of the slightest interest to the public, so I beg you to excuse me from making the very considerable effort involved in writing. I regret if this causes you a little disappointment, but at 83 I asked for a quiet period before the end'. This is a story in itself! I realise the driving force needed in old age to write, but, if other collaborators had given me the same replies, I should have been spared the mental, as well as the eye strain, of compiling these reminiscences at my time of life, 76!"





AUTHOR'S PHOTOGRAPHS

# OFF THE BEATEN TRACK

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Most are at military establishments, but these two occupy a "Traffic Police Training Park" in the northern suburb of Punjabi Bagh. A miniature road layout surrounds a Soviet-designed Mil Mi-4 Hound helicopter and a Folland Gnat built under licence by Hindustan Aeronautics Ltd (HAL).

India operated at least 60 examples of the Hound. First flown in 1952, it resembles the USA's Sikorsky S-55/H-19 on steroids, and more than 4,000 were built in the Soviet Union and China (as the Harbin Z-5). The rear double-clamshell doors enabled the carriage of a substantial load.

Originally designed and built in Britain, the Folland Gnat single-seat fighter aroused little interest from the RAF in the late 1950s — unlike the Indian Air Force, which ultimately acquired 140 examples. Most of these were licence-built by HAL, as well as 89 examples of a heavily modified variant of the Gnat known as the Ajeet.

In dogfights the Gnat enjoyed success against the battle-tested but less agile North American/Canadair F-86 Sabre; it was also highly effective

in the ground-attack role during the 1965 and 1971 Indo-Pakistan wars. Withdrawn from service during 1991, more than 50 Gnat/Ajeet examples are preserved across India, indicating the ease of mounting this diminutive fighter and the high regard in which it is held.



**Both the Gnat (ABOVE) and Hound (BELOW) are in comparatively good shape but both have stern warnings not to touch. Located in a police training park, perhaps the Gnat is used for SWAT training... ouch! To get a bird's-eye view of the pair on Google Earth, enter the co-ordinates 28.67266, 77.13864.**







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